June, 1960

MANAGEMENT *and* BUSINESS AUTOMATION

First Nationwide Survey of Computer Department Salaries

Page 20

FROM RECORDS TO RESULTS,

RCA Electronic Data Processing Sets New Standards in Reliability!

a unique magnetic tape system of unequaled reliability and security . . . a finely *balanced* system of checks in the computer and input/output devices.

Magnetic tape processing, critical to EDP reliability, achieves a new high standard with RCA Electronic Data Processing Systems. In the RCA 501 and 601, for example, completely duplicate records are provided—dual recording in side-by-side bands. In tape operation the two channels reinforce each other for extreme accuracy. Other tape checks are added for even greater accuracy and security . . . echo checking on information dispatched to the 501 recording head, the use of a reread head in the 601 . . . rollback provision for rereading in case of transient error . . . tape flaw marking and detection . . . safeguards against accidental erasure of master tapes . . . all highly effective in delivering top tape performance.

In the computer and input/output units, accuracy and reliability are again "the rule." Within the computer, all internal information transfers, all transfers to and from memory, and all transfers to and from buffers are parity checked. Arithmetic operations are checked by complements. Other checks are maintained on impossible instruction combinations and on timing errors.

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For further information, write Farrington Electronics Inc., Needham Heights 94, Massachusetts

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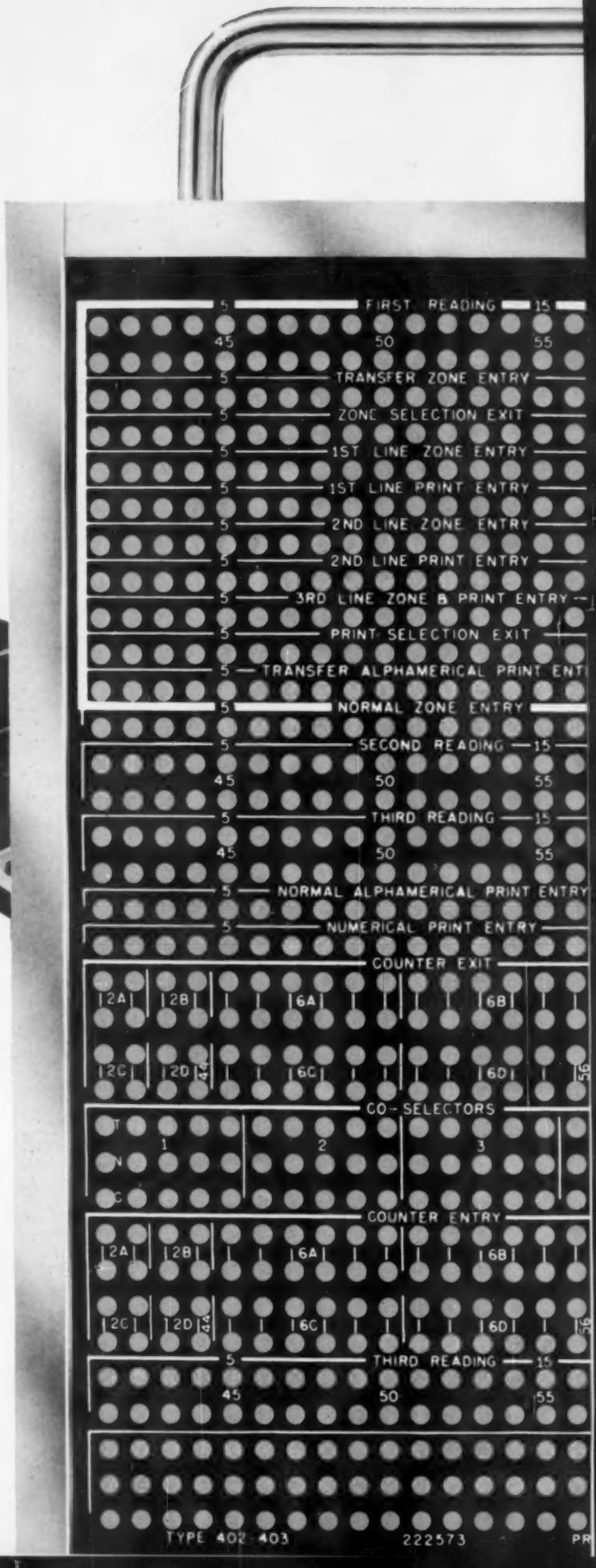

MANAGEMENT *and* BUSINESS AUTOMATION

June, 1960
Vol. 3, No. 6

New ideas, developments, applications, results, and the human impact of business automation in commerce, industry and government.

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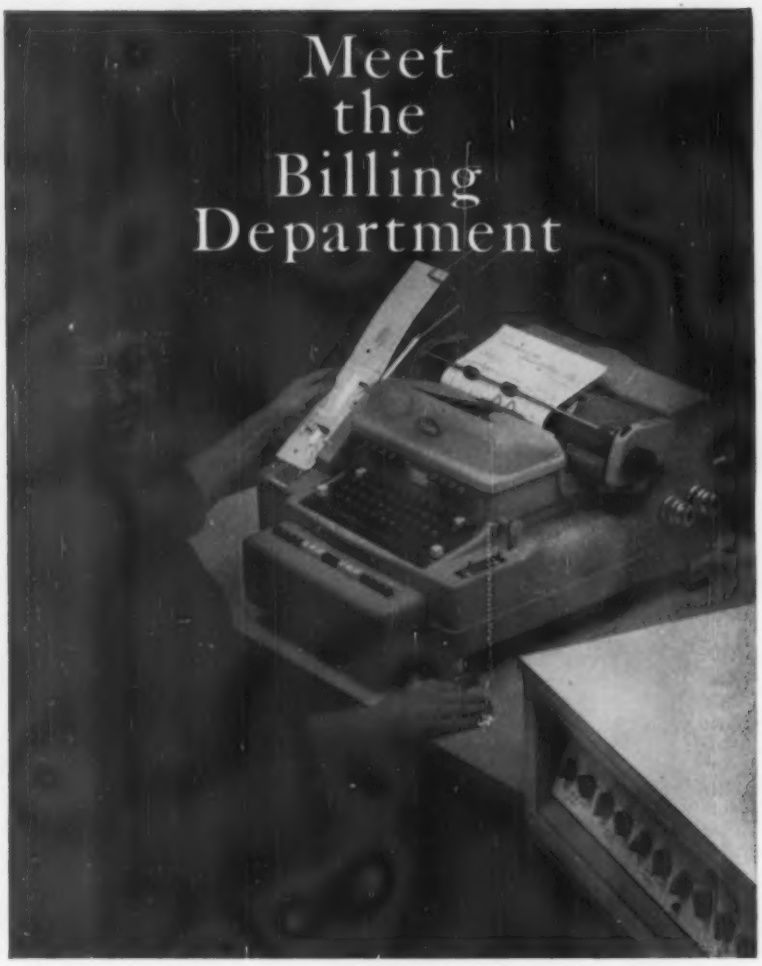

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SALES, SERVICE AND INSTRUCTION THROUGHOUT THE U. S. AND THE WORLD

For More Information Circle Reader Service Card No. 154

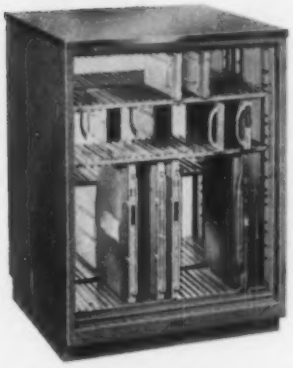
Scanning the Issue...

The **"National Survey of Computer Department Salaries,"** page 20, is actually more than a survey. It is the first attempt to introduce standard job classifications and levels in the computer field. The duty descriptions used are a condensation of those provided by many firms, and it is hoped that they will serve as the basis for a set of standard descriptions in the future. The survey clearly established the need for standardization. For example, the classification "Programmer - Senior" was reported under 27 different titles, illustrating the futility of salary comparisons by job title alone. While many will undoubtedly take exception to the descriptions used, at least this represents a beginning.

Editor Bill Christian has "cleared the air" in exposing the **"Myth of the Electronic Brain,"** page 26. After diligently gathering all available written material and contacting outstanding authorities in the field, he found that his desk now harbors what could very well be the most comprehensive compilation of information now available on the "thinking power" of the modern computer. This information, up-dated, should provide background for future articles along the same line.

The team efforts of **"Management Services — Problem Solving Force at Union Carbide"** are described in an on-the-scene view by Editor Fred Vogel. This unique activity serves as a unifying force in the company's data processing program.

Keeping track of students and finances at a university the size of Penn State is a job equal to that of big business. That's why **"Data Processing Goes to College"** in the form of a computer. Page 38.



Monarch FILAWAYS offer you great flexibility in the storing of reels, control panels, trays, card cartons and forms. Four models provide ample choice to meet specific requirements.

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RANDOM ACCESS

Information bits from the Editor's memory file

It Was All in His Head

Dade County's (Fla.) data processing division recently found itself without a boss, and according to news account—without any procedures. The confusion was, in part, due to the resignation of the data processing chief who, "unfortunately kept a lot of the county's planning in his own mind, and it went with him while the machines remained."

The assistant county manager, Hoke Welch, added that further complications were brought about by too much data being fed indiscriminately into the machines. This included facts on homestead exemptions, garbage fees, some police records, and all sorts of performance records of the county's departments. According to Welch, the former manager put everything into the machines that various officials told him to. Welch has formed a committee to screen new applications.

Who's Who in Solid State

The Big Three of the computer industry, IBM, RCA, and Remington Rand, have challenged each other as to who leads in delivery of solid-state systems. RCA precipitated the debate when John E. Johnson, vice president and manager of marketing for the Electronic Data Processing division, stated at a press conference that of 25 solid-state computers currently in use by industry, 15 were RCA 501's.

Gilbert E. Jones, president of IBM's Data Processing division, issued a statement that his company had 40 solid-state computers installed and operating. Remington Rand countered with the comment that they had "many more than 25 commercial solid-state Univacs in operation."

No doubt the various leadership claims are based on different definitions of terms and the distinction between systems designed for military and commercial use. Whatever the reason, the controversy indicates the rising temperatures accompanying the increased competition in the computer industry.

Electronic Cupid

With the aid of a Samos automatic sorter and key punch (distributed for a time in this country by the Underwood Corp.), Miss Lee Morgan runs the Scientific Introduction Service in New York City to bring "compatible" couples together.

Miss Morgan gives psychological tests to her clients, analyzes their handwriting, and puts them to a thematic apperception test. (The latter is to judge the candidates spontaneous reaction to uncaptioned, realistic pictures.)

The data collected is transferred to punched cards, and in a colorful, if not necessarily scientific fashion, the sorter then matches individuals in appropriate pockets. Blue cards for the boys and pink cards for the girls.

Miss Morgan estimates that between 10 and 15 percent of her "cardboard lovers" eventually take the matrimonial plunge. Her major complaint: "So many don't tell me. They just vanish, and sometimes I hear long afterward that they've married and had babies."

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Mr. J. R. Connelly, Manager of Organization and Personnel.

STROMBERG
DIVISION OF GENERAL TIME CORPORATION
THOMASTON, CONNECTICUT

Circle Reader Service Card No. 158

from the Publisher's Desk

SLOWLY, but surely, those who have grown up in the machine accounting profession are beginning to expand their view of automation beyond the doors of the tab room.

It is our opinion that the future of our country's business operations today is dependent, in a large measure, on the speed with which complete automation is applied to clerical functions.

To effect this conversion it is vital that the head of the tab department concern himself with the mechanizing and integrating of all of the operations which can affect input data, as well as those operations involving output. Such equipment as intercom systems, centralized dictating, high speed duplicating and copying machines, and all types of addressing and automated mailing systems (formerly the exclusive sphere of the office manager) now must be of major interest to data processing and machine accounting managers.

Real evidence that such interest is on the increase is provided in the records of our Reader Service Bureau which processes the inquiry cards received daily from our readers. Many of the so-called office equipment items described in MBA Showcase now develop much greater response than during the early months of publication. Machine accounting and data processing managers are showing particular interest in communications equipment of all types and in equipment normally associated with mail-room operations. It is obvious that these are areas where serious bottlenecks are hampering company-wide data processing systems.

In MBA Showcase, our editors will continue to describe outstanding products not associated generally with data processing and machine accounting. By so doing readers will have the benefits of keeping up to date in these other important areas without the need to scan other sources for the same purpose.

Charles W. Gilbert

MANAGEMENT and BUSINESS AUTOMATION

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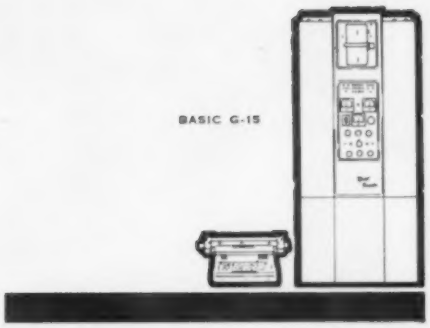
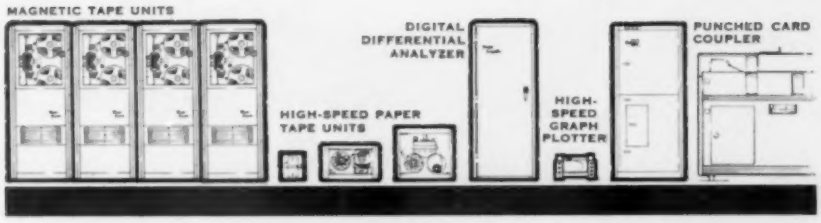


OF ALL LOW-COST COMPUTERS ONLY THE BENDIX G-15 IS PREPARED FOR YOUR **FUTURE**



Before specifying a low-cost computer, ask yourself this question: *"Will the computer be adequate for the future, as well as for our present computing needs?"*

With the Bendix G-15 you don't have to worry about out-growing your computer for years to come. Start with the basic G-15. It comes with every basic element you need...an alphanumeric typewriter, a paper tape punch, and a high-speed photoelectric tape reader. Then, as your computing needs grow and vary, expand your system by selecting from the complete line of accessories illustrated above. Sale or rental prices are extremely low, and performance compares favorably with systems priced many times higher. Write for details.

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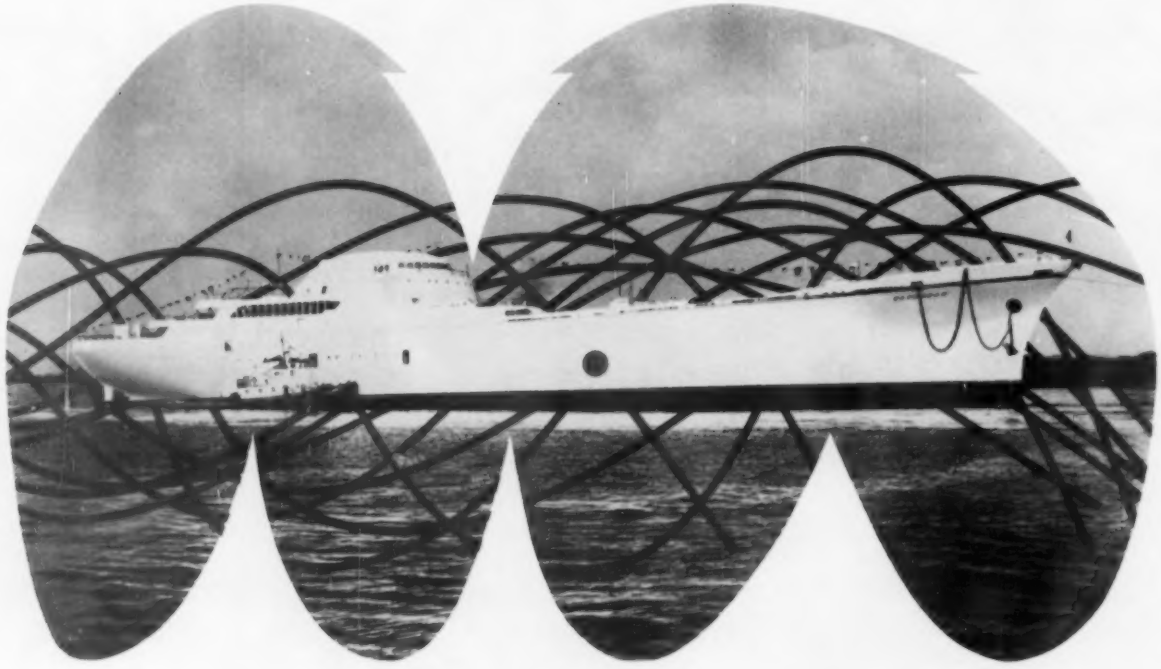
THE Bendix CORPORATION

For More Information Circle Reader Service Card No. 159

For the Babcock & Wilcox Company:

a Burroughs 205 computer backed the team that introduced atomic power to the merchant fleet...



another Burroughs computer is helping build one of the world's largest steam boilers...

and still another is speeding a vast research and development program

History has already earmarked July 21, 1959, in remembrance of launching the N. S. Savannah—the world's first nuclear merchant ship. This graceful queen of the seas may well be the precursor of a vast atomic merchant fleet—ships operating quietly and efficiently on nuclear engines.

Yet months before touching water, the Savannah's nuclear propulsion system was obtaining hundreds of "trial runs" on a Burroughs 205 computer at The Babcock & Wilcox Company's Atomic Energy Division in Lynchburg, Virginia.

Long before the vessel was launched these computer runs predicted changes that were to take place in the heart of the nuclear reactor. With the aid of these data, decisions were made as to the optimum size of the reactor, the lifetime of the fuel elements, amount of fuel needed, approximate costs and myriad other specifications.

Of course, a simulated run could have been made with a desk calculator—but it would have taken one year to complete a single run. The 205 has completed the same job in just a few hours.

This is the latest installment in a success story that started in November, 1955—the installation date of the Burroughs 205 at the Atomic Energy Division. Aside from the N. S. Savannah project, the same computer contributed immeasurably to other reactor designs, and other engineering work involving stress and thermal calculations, plus cost accounting data processing.

A recognized pioneer in the application of electronic data processing equipment, B&W was one of the first companies to develop its own automatic programming system. The effect of this powerful programming aid—called DUMBO—is to extend the capabilities of the 205 to hundreds of engineers without special knowledge of computer characteristics and techniques.

B&W engineers at Lynchburg are now able to write a plan for the computer to follow; DUMBO then automatically translates the plan into 205 language for electronic data processing.

With valuable 205 experience on design problems of a different nature, B&W's Boiler division (at Barberton, Ohio) has now installed a larger Burroughs 220 computer system to handle its increasing activities. Now in the design stage, with the aid of the 220, is one of the largest steam boilers ever conceived. When finally erected, the new steam boiler will stand as high as a 22-story skyscraper, produce 4,900,000 pounds of steam per hour, and generate sufficient power to light a city of 5,000,000 population.

Whether designing mammoth power equipment or a small industrial boiler, the Burroughs 220 has become a vital tool from initial bid through final design. The Burroughs 220 is helping to win orders with fast-but-realistic proposals, slashing costs and lead time at every possible opportunity.

B&W, whose product range includes tubular products, refractories, and marine boilers, as well as stationary steam generators, is also spearheading the development and construction of nuclear stationary and marine propulsion power plants. In all these programs, B&W depends upon the most modern analytical processing equipment.

At the company's Research and Development Center based in Alliance, Ohio, a third Burroughs computer has recently gone "on the air." This Burroughs 205 was purchased to process data for a variety of research experiments in the fields of heat transfer, fluid flow, stress analysis, and thermodynamics. Its immediate impact has been to free creative engineering talent from routine calculations and to reapply valuable human resources to the pursuit of new sources of economical energy. This 205 has already developed research data otherwise inaccessible.

All three Burroughs computers are helping B&W to meet a wide range of the nation's power requirements in the most efficient and economical way possible. Hundreds of other industrial and commercial users are confirming similar experiences.

Burroughs' complete line of electronic data processing equipment is backed by a coast-to-coast team of computer specialists, able to advise on how Burroughs can help you in your business. For additional information, write General Manager, Data Processing Systems Group, Detroit, Michigan.

Burroughs Corporation

"NEW DIMENSIONS/in electronics and data processing systems"

For More Information Circle Reader Service Card No. 160

Letters

Dear Sir:

Your editorial in the March, 1960 issue is most interesting, and I agree that a lack of compatibility among computing equipment of different manufacture is a costly item. It would undoubtedly provide substantial savings to many organizations if standardization in one form or another were legislated.

Unfortunately, however, the price of standardization is usually stagnation. To establish a uniform code or format would tend to bring the industry to a complete halt, thereby retarding progress toward faster, more efficient and lower cost data processing systems. During the past decade many organizations have embarked upon development programs to produce computing equipment for specific as well as general purpose applications. Great strides have been made, and one of the prices for this rapid advance is some lack of compatibility.

A good example of progress retarded by standardization is evident in punched card data processing. There has been little or no advancement in this medium since its introduction many years ago. I believe that if the electronic and magnetic data processing industry were to operate under enforced standardization, progress would come to a screeching halt, and we would remain for many years right where we are now in the state of the art.

While it may be true that we at TMI have an axe to grind in this field, it is a fact that many companies have stepped into the breach to produce equipment providing compatibility among various data processing systems. The cost of such equipment is more than offset by the versatility provided to users in enabling them to employ equipment most suitable for their needs.

It seems that automatic programming and compiling techniques, coupled with electronic translation equipment, will substantially relieve the burden of incompatibility.

Richard A. Terry
Director of Public Relations
Telemeter Magnetics, Inc.

Dear Sir:

Your April editorial, "Audit in Depth," is no doubt very applicable to many concerns. But one statement in the editorial should bring a large response of complaints. That statement reads "These re-runs are invariably the result of poorly prepared or outdated procedures."

You have assumed correct employe selection, good training programs, adequate machine maintenance, workable job schedules and, of most importance, the selection of machine department management capable of administration and supervision.

Too frequently, articles are written with a biased "line" or "staff" viewpoint. More articles of an integrated nature are required. Top management has been led to believe that machine installations require only button-pushing employes to produce timely results. Certainly the detailed procedure manuals must be written. But, equally necessary is administrative talent in the machine room to watch for human and mechanical error.

Where procedures have been used many times without difficulty and

(Continued on page 18)

So automatic and accurate you can start it and walk away!

Freedom from machine tending is only the beginning! The new Gathermatic by Thomas Collators brings to collating the speed and accuracy of larger, more expensive equipment... at a cost unbelievably low. Write today for complete information on the many ways you can speed up your collating operation and substantially reduce your costs.

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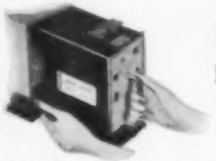
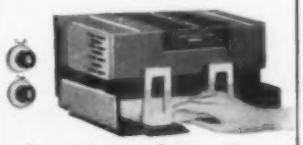
New convenience. Operator simply slides out film unit to load film, or to substitute unit with different reduction ratio (40 to 1, 32 to 1, 24 to 1). This also makes it practical for each department to microfilm with its own film unit—unitizing their work and reducing need for extra microfilmers.

New styling. The RELIANT 500 Microfilmer's trim good looks complement today's modern offices—reflect, in still another way, the experience gained by RECORDAK in thirty-three years of microfilming research and development.

Kodamatic indexing controls give you up to 100 different code settings for rapid reference to film images.



Film units can be interchanged in seconds to handle work of various departments more efficiently.



RECORDAK endorser (low-cost accessory) lets you cancel or endorse items while microfilming them.

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originator of modern microfilming—*now in its 33rd year*

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Send free 4-color folder describing new RECORDAK RELIANT 500 Microfilmer.

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The Egry Register Company, Dayton 2, Ohio; Leipsic, Ohio; Los Angeles, California. In Canada: Egry Continuous Forms, Ltd., Toronto, Ontario.

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Letters

Continued from page 14

the work performed on schedule, can the procedures be blamed if now the work is accomplished only with re-runs and without meeting the schedule? Will an "audit in depth" of punched card operations spotlight the cause of trouble any better than unsatisfactory daily results? Possibly, top management would be made more aware of the success or failure of its machine room work if presented a weekly or monthly summary of job performance.

Basically, auditing of machine room work is as necessary today as auditing of manual clerical operations was necessary yesterday. In the sudden explosive growth of machine data processing, this fact has been too often overlooked. This is especially true in the procedure writing stage. Auditors have not been consulted, check points have not been provided and only after-the-fact has top management remembered to call in the auditors.

It is not surprising that Walston and Co. were being robbed. What is surprising is that other companies have not learned from this experience and instituted auditing procedures. Punched card operations made auditing a more difficult science. Magnetic tape and electronic computers make the job even more difficult. Unless auditors are made an integral part of the machine department, many business concerns will find themselves out of business without knowing what happened.

But let us not blame either procedures or machine processing as separate entities. The two go hand-in-hand.

R. C. Barney
Business Systems Staff
Supervisor
New Jersey Bell Telephone Co.

Ed. Note — Items such as procedures, schedules and machine utilization were merely offered as examples of the efficiency tools often lacking in machine installations. The problems may go deeper in specific instances. Hence the need for "Audit in Depth."

Computer Programmers:

Where do you stand in programming progress?

Are you currently in a position to move upward and forward into newer, more interesting levels of programming? Or is your topmost step still well below the height of the art?

The advanced areas in which we work, e.g. MACRO symbolic coding, problem-oriented language for data processing, and research in Universal Computer Oriented Language only partially indicate the importance of computer programming at SDC.

There is also a basic professional advantage in the fact that programming is a primary function at SDC, rather than a service activity. This unusual situation stems directly from the fundamental nature of our work – developing extremely large computer-centered control systems. Among the many professional values in this strongly computer-oriented environment are the large number of supervisory positions open to programmers, and the fact that most programming supervisors have programming backgrounds.

Positions now open at all levels (at Santa Monica, California and Lodi, New Jersey).

The extension of SDC's programming activities into new areas of large computer-centered control system development has created openings for Programmers at several levels of experience, including senior status. Please send your inquiry to D. B. Price, SDC, 2499 Colorado Avenue, Santa Monica, California.

"SP-127 ANCHOR An Algorithm for Analysis of Algebraic and Logical Expressions," a paper by Howard Manelowitz of SDC's staff is available upon request. Send request to Mr. Price at SDC.

SDC

SYSTEM DEVELOPMENT CORPORATION

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from MBA Research . . .

National Survey Of Computer Department Salaries

THIRTY-FIVE different computer department positions have been analyzed for salary, responsibilities and job content, as part of a comprehensive survey of computer personnel conducted by MANAGEMENT AND BUSINESS AUTOMATION magazine. The survey was directed by Philip H. Weber and Co., specialists in wage and job classification analysis.

A total of 489 companies participated in the survey which covered some 33 industrial categories in 78 cities and 22 states. Job and salary data was gathered on over 7,000 employes.

The major aim of the survey was to accurately determine rates of compensation for each position based on a detailed listing of job responsibilities and content, rather than simply on a job title—which is, erroneously, the governing factor in many wage studies. To accomplish this task the computer and auxiliary departments were divided into six general groups: control, analysis and procedures, programming, computer operations, auxiliary equipment, and E.A.M. equipment. Job classifications were developed for each job in the six groups and classification titles were assigned to indicate the level of each job in the group. Descriptions were prepared to define these levels as completely as possible.

Participants were requested to match their jobs with the proper classification regardless of their job titles, and not to include any mixed or unmatched jobs. A set of limiting or qualifying characteristics were provided to assist in matching job content with the proper description. For example:

Supervisor—Usually in full charge of all activities of the particular section;

Lead—Usually considered as the Assistant Supervisor or has full technical duties as a senior but also has supervisory duties of assigning work to others;

Senior—Usually competent to work at the highest level of all technical phases of the activity while working on own most of the time, may give some direction and guidance to lower level classifications;

A—Usually competent in most phases to work on his own and only requires some general direction for the balance of activities;

B—Usually fairly competent to work on several phases of the activities with only general direction but still needs some instruction and guidance for other phases;

C—Usually a beginner trainee in the activity who is under very close direction with his work carefully checked.

As a result of using the classification levels and descriptions to match jobs, the completed survey takes on a real meaning for comparative purposes. A study of the six charts will quickly indicate that the salary distributions have fairly close ranges for most jobs, and a good relationship from lowest to highest job in each family. There is also a good relationship between families.

The impossibility of any reliable comparison based on job titles is indicated by the wide variety of titles used by the participating companies. For example, over forty different titles were used to

Reading the Charts

Salary distributions were prepared for each job to show established minimum, established maximum and actual salary according to lowest, first quartile, median, average, third quartile, highest.

Lowest—lowest value reported for a job.

First Quartile—the rate where one quarter are below this rate and three quarters are above this rate.

Median—the rate where one half are lower and one half are higher.

Average—the total of the salaries of the total number of employes divided by the total number of employes for the job.

Third Quartile—the rate where three quarters are below this rate and one quarter are above this rate.

Highest—highest value reported for the job.

Computer Control Personnel

Job	Range	Est. Min.	Est. Max.	Actual Salary
Manager of Computer Operations	Low	121	150	125
	1st Q.	157	222	175
	Med.	193	279	213
	Avg.	195	270	218
	3rd Q.	231	314	244
	High	303	425	330
Assistant Manager of Computer Operations	Low	110	138	115
	1st Q.	139	205	148
	Med.	156	236	178
	Avg.	163	237	182
	3rd Q.	180	300	208
	High	228	336	264
Technical Assistant to the Manager	Low	114	151	110
	1st Q.	125	178	142
	Med.	128	202	159
	Avg.	148	207	153
	3rd Q.	147	231	173
	High	177	261	192
Coordinator of Computer Operations	Low	99	150	107
	1st Q.	115	188	127
	Med.	140	192	140
	Avg.	137	198	147
	3rd Q.	152	219	162
	High	178	250	231
Work Processing Scheduler	Low	110	140	98
	1st Q.	114	158	120
	Med.	120	165	121
	Avg.	126	176	137
	3rd Q.	143	192	147
	High	153	234	216
Electronics Mechanic	Low	69	127	81
	1st Q.	69	127	92
	Med.	85	133	110
	Avg.	80	134	105
	3rd Q.	85	133	115
	High	92	148	127

Analysis – Procedures Personnel

Job	Range	Est. Min.	Est. Max.	Actual Salary
Supervisor Analysis and Procedures Operations	Low	141	147	124
	1st Q.	154	231	148
	Med.	173	255	200
	Avg.	181	260	191
	3rd Q.	196	283	230
	High	248	368	284
Lead Analysis and Procedures Operations	Low	113	138	113
	1st Q.	135	198	162
	Med.	150	210	170
	Avg.	158	225	169
	3rd Q.	173	259	173
	High	233	310	230
Senior Procedures Analyst	Low	102	127	103
	1st Q.	118	179	142
	Med.	137	192	165
	Avg.	142	201	170
	3rd Q.	162	217	192
	High	214	310	340
Procedures Analyst A	Low	92	110	98
	1st Q.	114	162	133
	Med.	135	182	156
	Avg.	133	189	158
	3rd Q.	152	214	182
	High	160	267	254
Procedures Analyst B	Low	81	118	89
	1st Q.	109	144	120
	Med.	114	165	132
	Avg.	109	163	135
	3rd Q.	125	178	142
	High	160	205	194
Procedures Analyst C	Low	94	111	85
	1st Q.	99	148	114
	Med.	110	151	125
	Avg.	106	147	120
	3rd Q.	114	158	131
	High	120	165	150

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identify the position of Manager of Computer Operations. Included were: Chief of Computing; Computer Systems Manager; Manager, Computer Service Center; Data Processing Manager; Manager, Electronic Data Processing; and Manager, Data Processing Department. The latter enjoyed a slight margin of popularity over all the titles listed.

According to the survey, the average weekly salary for a manager of computer operations is $218. The median salary—the exact middle point of all salaries reported—was $213. This indicates that the computer manager has about a thirty percent salary edge over his data processing counterpart, the machine accounting manager. The latter's weekly median salary was $163, according to MBA's survey of machine accounting salaries conducted last year. (See June '59, MBA.)

It's still a man's world

Rating just under the computer manager in salary importance is the job of Supervisor — Analysis and Procedures Section, with a weekly average of $191. The survey indicates that programmers also play a major role in the economics of data processing, with average salaries running from $179 for the programming supervisor to $106 for a beginner.

The computer department is still a man's world according to the statistics. Only two firms reported a female manager, and only one company reported a woman as supervisor of the programming section. Less than 15 percent of the programmers reported were women.

A majority of the firms indicated college training as a minimum requirement for positions in the control and programming classifications. Fourteen of the companies required post graduate training for the top computer positions.

An average of five major applications were reported for each computer installation. The most popular applications and the percentage of reporting firms were: Financial and Accounting, 74%; General Management Reports and Controls, 72%; Sales Statistics, 70%; Payroll and Labor Costs, 63%; Cost Accounting, 50%; Customer Accounting, 50%; Purchasing and Inventory Control, 41%; Pure Research and Development, 30%; Production Control, 27%; and Production Engineering, 14%.

The survey indicated an average monthly rental of $15,000 for computer installations. Average personnel numbered 25. Among the computers reported were 24 IBM 705's, three 709's and one 7070. Sixteen Remington Rand Univacs were included along with a number of other makes. Leading the group was the IBM 650; 74 of these being reported.

Continued on Page 24

Computer Programming Personnel

Job	Range	Est. Min.	Est. Max.	Actual Salary
Supervisor Programming	Low	123	150	101
	1st Q.	137	185	150
	Med.	160	223	171
	Avg.	162	226	179
	3rd Q.	185	245	208
	High	219	325	258
Lead Programmer	Low	104	148	115
	1st Q.	125	175	152
	Med.	138	199	165
	Avg.	143	208	168
	3rd Q.	159	231	181
	High	187	310	216
Senior Programmer	Low	69	104	92
	1st Q.	111	156	130
	Med.	125	177	138
	Avg.	127	177	140
	3rd Q.	144	192	150
	High	174	310	209
Programmer A	Low	73	107	83
	1st Q.	99	135	106
	Med.	114	158	113
	Avg.	114	157	118
	3rd Q.	125	175	123
	High	160	238	195
Programmer B	Low	62	91	63
	1st Q.	91	116	102
	Med.	103	133	107
	Avg.	103	137	113
	3rd Q.	119	158	121
	High	139	205	190
Programmer C	Low	69	87	77
	1st Q.	81	104	98
	Med.	98	125	100
	Avg.	94	123	106
	3rd Q.	101	145	115
	High	119	152	140

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Computer Operations Personnel

Job	Range	Est. Min.	Est. Max.	Actual Salary
Supervisor Computer Operations Section	Low	100	131	113
	1st Q.	127	178	144
	Med.	142	202	163
	Avg.	149	210	170
	3rd Q.	170	259	201
	High	219	325	248
Lead Computer Operator	Low	69	92	80
	1st Q.	103	139	115
	Med.	115	159	129
	Avg.	116	160	135
	3rd Q.	132	175	157
	High	172	226	200
Senior Computer Operator	Low	58	74	60
	1st Q.	90	120	102
	Med.	100	135	112
	Avg.	100	134	112
	3rd Q.	114	150	123
	High	149	195	165
Computer Operator A	Low	55	81	75
	1st Q.	84	108	92
	Med.	92	115	104
	Avg.	91	118	105
	3rd Q.	101	135	114
	High	135	154	145
Computer Operator B	Low	55	81	65
	1st Q.	75	99	82
	Med.	80	107	95
	Avg.	82	105	94
	3rd Q.	86	113	105
	High	115	135	119
Computer Operator C	Low	56	70	57
	1st Q.	74	87	75
	Med.	75	98	94
	Avg.	77	98	88
	3rd Q.	83	103	97
	High	90	122	118

E.A.M. Equipment Personnel

Job	Range	Est. Min.	Est. Max.	Actual Salary
Supervisor EAM Equipment	Low	65	84	83
	1st Q.	110	147	122
	Med.	130	187	145
	Avg.	131	185	148
	3rd Q.	151	215	173
	High	189	335	241
Tabulating Machine Operator B	Low	45	70	45
	1st Q.	69	95	83
	Med.	77	102	92
	Avg.	78	103	91
	3rd Q.	88	115	100
	High	101	136	136
Key Punch Operator B	Low	40	55	44
	1st Q.	58	79	66
	Med.	64	88	77
	Avg.	67	91	77
	3rd Q.	72	93	89
	High	98	111	110
Flexowriter Operator	Low	56	71	58
	1st Q.	58	76	62
	Med.	64	86	74
	Avg.	66	87	75
	3rd Q.	76	100	87
	High	82	101	95
Teletype Operator	Low	51	68	58
	1st Q.	58	80	68
	Med.	66	83	77
	Avg.	63	85	75
	3rd Q.	70	89	81
	High	76	114	98
Control Clerk	Low	46	60	50
	1st Q.	55	82	62
	Med.	65	91	77
	Avg.	66	91	77
	3rd Q.	77	100	88
	High	98	130	125

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Auxiliary Equipment Personnel

Job	Range	Est. Min.	Est. Max.	Actual Salary
Supervisor Auxiliary Equipment and Operations	Low	85	115	124
	1st Q.	121	158	129
	Med.	132	162	135
	Avg.	126	158	138
	3rd Q.	138	163	150
	High	138	192	151
High-speed Printer Operator	Low	78	102	59
	1st Q.	92	104	105
	Med.	104	118	117
	Avg.	99	119	110
	3rd Q.	109	126	119
	High	116	152	122
Magnetic Tape Librarian	Low	60	80	52
	1st Q.	69	95	78
	Med.	78	106	95
	Avg.	82	108	91
	3rd Q.	90	122	111
	High	117	135	138
Coder	Low	60	73	51
	1st Q.	61	75	55
	Med.	68	95	67
	Avg.	80	117	77
	3rd Q.	113	187	96
	High	113	187	142
Data Examination Clerk	Low	46	72	58
	1st Q.	60	89	68
	Med.	69	92	92
	Avg.	72	96	86
	3rd Q.	77	102	98
	High	116	152	133

COMING

A detailed analysis of the information compiled in the survey, along with special supplementary material, is now being prepared for MANAGEMENT AND BUSINESS AUTOMATION *by P. H. Weber & Co. This report will soon be available to MBA readers. Watch for information in the July issue.*

Participating firms were asked to comment on "items to avoid" and "items to do," based on their own data processing experiences. A majority warned against "underestimating programming time." Others cautioned against "over-selling" the computer's capabilities to top management. Additional comments provided many interesting thoughts. One respondent said: "Avoid plans for parallel operation. In almost all cases parallel is not feasible due to expense and personnel. Also, the computer results are usually in different format or of a slightly different nature making parellel difficult, if not impossible." Another had this to say: "Don't underestimate the importance of pre-computer processing of input, and the quality controls which may be necessary in this area."

"Blue chip" participants

Among the companies participating in the survey were: Henry J. Kaiser Co., Dan River Mills Inc., Kennecott Copper, Richfield Oil Corp., Standard Oil Industries, Standard Oil Ohio, Remington Arms Co., U. S. Gypsum Co.

Hunt Foods Inc., Armour & Co., Quaker Oats Co., Corn Products Co., Falstaff Brewing Co., National Biscuit Co., General Foods Corp., Oxford Paper Co., St. Regis Paper Co., New York Times, Curtis Publishing Co.

Simoniz Co., Olin Mathieson Corp., B. F. Goodrich Co., Spencer Shoe Corp., Brown Shoe Co., Corning Glass Works, Carborundum Co., Owens-Illinois Glass Co., Inland Steel Co., Aluminum Corp. of America, Joseph T. Ryerson & Co., S K F Industries Inc.

Fairbanks Morse Co., International Harvester Co., Deere & Co., Clark Equipment Co., National Cash Register, Admiral Corp., Motorola Inc., Westclox, Studebaker Corp., Cessna Aircraft Co., Republic Aviation Corp., Bell and Howell Co., American Optical Co.

New York, New Haven & Hart Railroad, Southern Railway Systems, Illinois Central Railroad Co., Long Island Railroad, New York Central Systems, Grace Line, Inc.

North American Aviation Inc., Capital Airlines, United Air Lines, Pan American World Airways, Braniff International World Airways, Texas Eastern Transmission Corp., Great Lakes Pipe Line.

Northern Natural Gas, Southern California Edison Co., Pacific Gas & Electric, Boston Edison Co., Minneapolis Gas Co., Parke Davis Co., Upjohn Co., Merck & Co., Inc.

Aldens Inc., Marshall Field Co., Montgomery Ward Co., Spiegel Inc., Jewel Tea Co. Inc., Pacific Finance Corp., American National Bank & Trust Co., Chase Manhattan Bank, 1st National Bank of Oregon, 1st National Bank of Dallas.

Continued on Page 52

Job Descriptions of Major Positions in Survey

The job titles and descriptions presented here and on page 52 represent some of the major positions detailed in the survey. Firms participating were asked to match their jobs to the descriptions listed here for the sake of accuracy.

MANAGER OF COMPUTER OPERATIONS—Plans, coordinates and supervises electronic data processing analysis, programming and machine operations. Assigns personnel, and schedules work flow to facilitate production. Instructs or supervises training of personnel in operation of computer and its components and peripheral equipment. Cooperates with programmers in testing new and revised programs. Oversees insertion of program instructions into computer. Guides and supervises operators in locating and overcoming computational errors and machine stoppages by analyzing program instructions and verifying plugboard wiring against wiring diagrams. Arranges for maintenance inspections and revises schedules to allow for maintenance and repairs. Keeps records and prepares reports concerning production, operating time and down-time. May coordinate flow of work to assure continuity of operations between shifts. May participate in discussions with technical personnel such as project planner, data processing systems or systems analyst concerning budget proposals, machine capability or other production problems.

ASSISTANT MANAGER OF COMPUTER OPERATIONS—Under general direction, assists the manager in directing and managing the various sections of the computing divisions. Participates in research and procedural studies. Assists in planning, scheduling and coordinating the work of the division. Develops data on the cost, accuracy, speed and other advantages of existing and/or newly developed processing equipment. Gives counsel and advice to other departments studying the feasibility of computer systems for their operations. Assists in controlling expenditures in line with the budget.

COORDINATOR OF COMPUTER OPERATIONS—Under general supervision, coordinates activities of computer division with other divisions in the company. Determines priorities in both programming and machine time to guarantee effective service to all users, by establishing standard forms and procedures for routine service. Maintains contacts with all using divisions, other management services, and own services to coordinate activities for best results with least possible delay. Participates in evaluating contribution of computer use to overall company program, improving the service when possible, extending its use to areas where feasible and participates in recommending other methods when the computer is not the optimum method.

SUPERVISOR — ANALYSIS AND PROCEDURES SECTION — Plans, coordinates and supervises the Analysis and Procedures Section engaged in the establishment and installation of new or revised systems and procedures concerned with the computer division. Studies the proposals concerning the acquisition, disposal and use of electronic business machines used or to be used and makes recommendations on the action to be taken. Assign personnel to the various projects and instructs them directly or directs their training in analysis and methods procedures. Collaborates with other sections throughout the company personnel to coordinate their activities with own activities. Prepares reports for designated individuals concerning the activities and progress of his section.

LEAD—ANALYSIS AND PROCEDURE OPERATIONS—Under general supervision or supervisor either acts as his assistant or performs duties comparable to the senior but in addition assigns work to, instructs and checks the work of others in the analysis and procedures section including the seniors. Assists in the scheduling of the work of the section and the assigning of personnel to the various projects being studied or being processed. May coordinate activities of section with other sections of the overall computer division. May act for supervisor of the analysis and procedures section in his absence.

PROCEDURE ANALYST, SENIOR — Formulates mathematical statement of engineering, scientific or business problems and devises procedures for solutions of problems by electronic data processing system. Confers with engineers, scientists and officials concerned to state problems in form capable of being solved. Prepares charts, tables and diagrams to assist in analyzing problems, working with a variety of scientific, business or engineering tables and formulas, and often requiring a good knowledge of mathematics. Devises mathematical procedure to solve problems by electronic computer, keeping in mind capacity and limitations of equipment, operating time and form of desired results. May alter design of computer system to permit solutions of problem. Evaluates results of machine calculations to determine if data meets needs of problem, and prepared reports. Analyzes reasons for failure of computer to solve problem, and revises logic and procedures involved. Develops mathematical formulas and procedures to provide more efficient machine operations. May prepare programs.

SUPERVISOR, PROGRAMMING SECTION—Plans, schedules and supervises preparation of programs to solve scientific, mathematical and technical problems, or to process business data by means of electronic data processing equipment. Assigns, outlines and coordinates work of programmers engaged in writing programs and routines. Designs standard flow charts and diagrams and develops programming procedures to increase operating efficiency. Writes and debugs (diagnose and correct) complex programs involving a number of mathematical equations and breakdown of program into more than one run prior to submitting data for processing. Trains subordinates to prepare and write programs, routines, flow charts and diagrams. Reviews and evaluates work of staff and prepares periodic performance reports. Collaborates with systems analyst and other technical personnel in planning operating schedules, suggesting equipment needed to meet operating demands, and making feasibility studies concerning new projects. Operates console to test sample routines. Prepares reports and maintains records of workload and progress.

PROGRAMMER A — Under general supervision analyzes and defines systems requirements to develop programs for electronic data processing. Conducts detailed analysis and study of all systems requirements and develops all levels of block diagrams and logical flow charts. Translates the details into a program of coded instructions used by the computer. Tests, checks and debugs the computer programs; revises and refines as required and documents all procedures used throughout the program when it is formally established. Reviews existing programs to make refinements, reduce operating time, improve present techniques and the like. May give technical assistance to lower level classifications.

Continued on page 52

Myth of the "Electronic Brain"

By William Christian

THE "ELECTRONIC BRAIN" is a myth, not a machine. But the myth, unfortunately, rivals the machine in popularity. The paradox arises from the continuing efforts of journalists, cartoonists and science fiction writers to give "personality" to the inanimate digital computer. This constant misrepresentation has confused the public to the point where they now look upon the computer as some kind of electronic monster that will eventually take over, not only their jobs, but their thinking ability as well.

In contrast, the American businessman has no dazzling illusions about the computer. He recognizes this machine as the greatest "thinking aid" of the century in helping him to make management decisions. Not only is it an indispensable tool in handling the vast amount of data involved in solving scientific, industrial and business problems, but it is a development that will have a more dynamic impact on current history than atomic energy.

Why is there a divergence of opinion about the computer? It basically results from a communication barrier between the theoretical scientist forging ahead to conceive more advanced machines, the applied scientist thinking of more practical ways to utilize present day computers, the businessman who accepts the computer as a complex necessity and the general consumer benefiting from the computer but with no idea as to what it is or how it works.

What is "Think"?

The solution of this communication problem first lies in finding a language which accurately describes the activity of the computer. A great deal of controversy arises over the word "think" when applied to the unique powers the computer possesses. "Think" has become a commonly accepted term in naming both brain and machine activity. But the only justification for using this word, in the latter case, is that the machine can produce results that require a particular thinking *function* of the human brain—symbol manipulation. The specific activity may most accurately be called "calculating" in the sense Webster describes it: "to determine by mathematical process." The word think then becomes standard, right or wrong, because it does seem to reasonably

express both functions and because common usage has *made* it acceptable.

The evolution of thinking aids begins with the ancient Chinese abacus, continues with the slide rule of the 16th century, Napier's "bones" (a hand digital calculating machine) of the 17th century, and gives way to the adding machine of the 19th century and the desk calculator of the 20th century. These aids were engaged only in mathematical manipulation. But when Liebnitz introduced his adding-subtracting-multiplying and dividing machine to the French Academy in 1672, doubts were raised as to whether there was a hidden operator inside the machine, because "no dead matter can perform the noblest of all mental processes, namely solving mathematical problems." The significant turning point, however, was Babbage's invention of the mechanical computer of the late 19th century. His forerunner to the electronic computer constituted the greatest threat to human superiority since Copernicus discovered the earth was not the center of the Universe.

"Metal" proficiency

On the basis of Babbage's machine, all that was needed was the application of the stored program concept, the energy of electrons and scientific imagination to invent the electronic digital computer and really give the human brain a run for its money. This computer, for all intents and purposes, was just another mechanical aid to calculation—except for its "ability to make decisions, under instructions, based on the material it is processing. The computer proved to be not just another counting and calculating machine, but the means of a new approach to thinking systems . . . It could not, independently, originate and sustain a conscious thought program. But properly instructed, it could accept a staggering mass of preselected information and quickly deliver a readily understandable summary report of its significance."[1]

Another question often raised is, exactly what the computer can now do for business. The benefits are specifically listed by M. O. Kappler, president of Systems Development Corp.: "it can receive and translate messages, delay messages for later use and route them internally or on request, compute (solve mathematical questions) and communicate instructions based on computations it has made, make decisions (it can make an optimization or a suboptimization—in other words analytical decisions), make sensitivity investigations, and, by releasing us from real time, enable us to investigate many, many more cases (i.e., more samples, more variables, more possible modifications) than we otherwise could . . ."[2]

There is certainly nothing mysterious about the computer as described above. Although its activity implies a great deal of "mental" proficiency, it is still more accurately described as "metal" or at most "electronic" proficiency. The important point to remember is that scientists have never created a machine that simulates the human brain. The best reason for this is that no one knows exactly what the human brain is or how it works. And for all his accomplishments the scientist has yet to create something he doesn't understand. The fact is, science is no closer at present to reproducing the brain *biologically* than it is to simulating its structure *electronically*. Moreover, there is no reason to recreate the imperfect human thinking mechanism, except of course, to prove that it can be done.

Like most myths, the "electronic brain" has some basis in trying to explain an unknown reality. The origin of the myth is sketchy, since many people are involved in the development of the electronic computer. One strand of the myth can be traced to such scientists as the late Dr. John von Neumann, professor of mathematics at the Princeton Institute of Advanced Study and Dr. Norbert Wiener, mathematician now at the Massachusetts Institute of Technology. Applying scientific imagination to the electronic digital computer, their approach was to simulate the human brain. This seems logical since most human inventions are imitations of some natural phenomenon.

The brains behind the "brain"

Dr. von Neumann closely connected the neuron in the brain with the electronic tube. He felt the impulse-response pattern could be considered a simple, logical mechanism and could be conditioned into learning. In spite of this he noted that the brain size and speed with its vast amount of impulse-stimuli knowledge slows it down. The

Dr. Norbert Wiener: "In my opinion the assumption that machines cannot possess any degree of originality should be rejected. . . . It is my thesis that machines can and do transcend some of the limitations of their designers."

Dr. John von Neumann: ". . . an approach toward understanding the nervous system from the mathematician's point of view."

computer, even as von Neumann knew it, was 10,000 to 100,000 times faster than the brain—but the brain is about 100 million times more compact.

Von Neumann readily admitted in his famous Silliman lecture at Yale in 1955, that his was "an approach toward the understanding of the nervous system from the mathematician's point of view." He also realized that, "The machine, under the control of its orders, can extract numbers from the memory, process them and return them to the memory . . . Thus all sorts of sophisticated order-systems become possible, which keep successively modifying themselves and hence also the computational processes that are likewise under their control . . . Bringing out the elements of similarity leads over well-known territory. There are elements of dissimilarity, too, not only in rather obvious respects of sizes and speed but also in certain much deeper-lying areas: These involve the principles of functioning and control, of over-all organization, etc. My primary aim is to develop some of these . . . the most immediate observation regarding the nervous system is that its functioning is prima facie digital."[3] The complexity of the nerve cell indicated to von Neumann that it was more that a "single basic organ." The lecture was important in communications among scientists, but received little attention in the daily newspapers as a scientific advancement.

Dr. Norbert Wiener began his most significant work with the electronic computer for the U. S. Government under pressure of World War II. Wiener is credited with saving many lives by making the computer an expert "gunman." His brain work on a machine that plotted the course of enemy aircraft, calculated the wind velocity, aimed and fired anti-aircraft weaponry, is also the ground work for anti-ballistics programs.

Following the war Wiener continued working with the computer at Harvard University, where

(Continued on page 46)

NEXT MONTH . . .

Computers Keep Ramblers Rolling

Electronic production control system at the American Motors plant in Kenosha, Wis., keeps cars moving on the assembly line.

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A request for data processing assistance comes to James Scott, left, manager of Electronic Data Processing, from William Adelman, center, manager of Corporate Employe Records. Clifford Crosby, staff analyst, Chemicals Div., listens in. The problem is then defined by D. Becker, programmer, next picture, left, W. Wallace, analyst, and P. Bartow, programmer, all in EDP department.

Management Services—Problem Solving Force at Union Carbide

By Frederick G. Vogel
Eastern Editor

GUIDING and coordinating the efforts of a far-flung network of data processing installations is the unique role assigned to one of the largest and most progressive management functions of its type in the nation, the Management Services Department of Union Carbide Corp.

This 60-employe activity serves as a major, unifying force in the company's rapidly expanding automation program. Most recent of its achievements is the establishment of a Computer Center which will supervise the merging of numerous company-wide procedures into a large-scale data processing system. This system will be installed in Union Carbide's new, 52-story headquarters office in mid-Manhattan, with delivery date expected to coincide with completion of the building in September.

A long-standing member of the select group of America's billion-dollar industrial organizations, Union Carbide is an acknowledged leader in formulating an internal automation policy for the integration and simplification of office procedures. As early as 1946, when business automation was an unknown quantity in the reviving peacetime economy, the corporation set up a one-man "systems" department to study the possibility of automating certain accounting procedures. Progress was rapid. Basing its planning on these early successes with the ramifications of this new office tool, and on the understanding of its potential, Union Carbide enlarged the studies. By 1956, they were consolidated into one activity, the Management Services Department.

Assisting the company's 18 major divisions and subsidiaries in the U. S. and Canada to convert from manual to machine processing, the activity makes available a reservoir of technological know-how. Requests for data processing assistance are channeled to Management Services as the need arises. These requests are studied by analysts,

Programmers in the EDP department tackle the solution to the problem. Left to right in the center photo are Kathleen Lundy; A. Arthur McCabe, supervisor of programming; Marlene Burati and David Shanno. The final report is then delivered. Pictured at right, left to right, are Mr. Adelman; U. S. Hurst, staff assistant, Linde Div.; Howard Melfi, EDP analyst, and Mr. Crosby.

and, if warranted, are scheduled for inclusion in an existing IDP/EDP system. Or, the request may provide a springboard for the purchase of a completely new system and the programming of a new processing routine.

As a service organization, the activity has many facets to its operations apart from installation duties. It will assign certain of its personnel on a part-time basis to one or more divisions for consultation on a specialized, intra-divisional problem. These experts may lead or merely participate in the group discussions. Occasionally, Management Services is used as a sounding board for ferreting out the most efficient approach to solving a particular processing puzzle—and for recommending its acceptance. At other times, technicians will perform such services as coding a new procedure for an installation originated and maintained by the operating division.

The shape of things to come

The organizational structure of Management Services assures efficient coordination of the corporation's diverse data processing activities. In addition to the newly created Computer Center, there are six other departments within the activity. These are Procedures, Records Administration, Industrial Engineering, Operations Analysis, Scientific Analysis and Program Services.

Briefly, the duties of each of these specialized "branch" departments are as follows:

Procedures—the survey, design and installation of administrative and clerical procedures, including mechanization, organizational review, planning and coordination and future planning of systems and procedures.

Records Administration—the design and control of forms; establishment of file patterns and records retention policies for records analysis; administration of corporate records center.

Industrial Engineering — the formulation and coordination of divisional industrial engineering functions; provision of technical assistance, consultation and training; application of industrial engineering concepts and practices in problems of physical distribution, warehousing, materials handling and plant layout; study and direction of industrial engineering projects.

Operations Analysis—the application of scientific methods and quantitative analysis to management functions.

Scientific Analysis—the application of analytical techniques in solving problems in research and development and engineering areas; liaison between the Computer Center and divisional engineering and scientific personnel.

Program Services—the analysis and design of business systems for implementation by electronic computers; computer programming of management, industrial and scientific problems; development of systems programming techniques; maintenance of internal communications system.

Each of the branch departments has its own manager, who in turn reports to J. K. Baker, Jr., the director of Management Services. Specific assignments are directed to the appropriate branch department for action, precluding duplication of

Model of the floor layout for the Computer Center in the new Union Carbide headquarters is studied by Lou Dunning, left, and George Stone, both staff engineers in the Industrial Engineering department.

effort or the encroachment of one branch upon the responsibilities of another. Corporation management is continuously apprised of the shape of things to come, which only the combined reporting of related branch departments, working independently toward a common goal, can provide.

Mechanization of accounting procedures has occupied almost 100 percent of the working hours of the Management Services group. In recent years, however, this figure has been reduced to about 20 percent. Newer projects such as an examination of all alternatives for processing and shipping mine ore in nuclear operations, blast furnace simulation and the design and rating of heat exchanges have been approved and automated.

Pooling their problem-solving

The infinite variety of the corporation's data processing equipment ranges from the small-scale to the large-scale computer and embraces an extensive assortment of peripheral units. This equipment has been installed in plants and sales accounting offices located at great distances from Union Carbide's home office. All told, the company has some 32 separate installations, some at points as remote as Mexico and India.

The corporation operates on the philosophy of decentralized management, and it is essential that data relating to those operations processed on a centralized basis be sent promptly to the home office for processing. This data must be returned in finished form to the facility as quickly as possible for decision making.

To meet these requirements, Union Carbide placed its order for an IBM 7090 immediately following announcement of the new system early in 1959. At the same time, Management Services swung into action, undertaking the studies that would lead to development of the Computer Center. The long-range view envisions a pooling of problem-solving in an effort to utilize a large-scale computer of the magnitude of the 7090. The system will combine many operational procedures now handled by other equipment and absorb many future applications already earmarked for computer servicing.

In the beginning, the computer will be used for statistical analysis, market research, liquid flow analysis, transportation routings, scientific research and the design of experiments. In the area of information systems, the Center will offer detailed assistance for future integration of such functions as employe records, stock and inventory maintenance, sales statistical reporting, information retrieval, and research analysis. It will maintain a computer program library for the study of the latest programming systems, sub-routines and techniques.

The system itself will incorporate a high-speed random access magnetic core memory and 12 high-speed and low-speed magnetic tape units for both business and scientific use. Advanced peripheral equipment will support the main computer.

Division of activity

To facilitate supervision, the computer activity was divided into three main sections. Two of them —Program Services and Scientific Analysis—were drawn from the ranks of Management Services' regular branch departments. The third is Data Processing Operations, which will be responsible for the scheduling and operation of the 7090 system and supporting peripheral equipment. This group will also process jobs in accordance with prescribed instructions and provide results in any of a vast number of specified forms.

Program Services, in turn, was sub-divided into three sections: Systems and Research Programming, Applications Programming and Problem Analysis.

The System and Research Programming subsection is staffed with highly skilled programmers who will work on advance programming systems. For example, they have assisted in the design and

development of business compilers, written generalized input and output routines, and modified and adapted various program operating systems to Union Carbide's requirements.

The Applications Programming and Problem Analysis sub-sections will handle program design and development for specific applications, as well as the analysis and design of systems which are to be implemented by the computer. Each of these sub-sections is staffed with professional applications programmers and analysts conversant not only in the broad "classical" systems concepts, but also in the mathematical techniques which may be built into a new computer system.

Objective guidance

The Scientific Analysis Section's primary efforts will be directed toward applying numerical analysis methods and other techniques used to obtain computer solutions to a variety of problems. Members of this group will undertake to assist the company's laboratory and engineering personnel to the degree desired in quantitative analysis and coordinate the regional activities within the Center itself.

Apart from these duties, all sections and subsections of the Computer Center will offer objective guidance and professional assistance in each of seven important areas:

Information Flow—design of information processing systems to minimize data handling and to expedite data retrieval.

Problem Analysis—identify inter-relationships of a problem and formulate a method of solution.

Mathematical Analysis—express the method of solution in mathematical terms and determine the nature of the answer.

Applications Programming—prepare a step-by-step series of instructions to the computer, in which the method of solution is presented to the machine in logical sequence.

Systems Programming — design, develop and modify generalized routines, compilers, translators, and programming systems to answer particular needs.

Machine Time—provide computer time for those who prefer to code their own problems. The Center will process the input information in accordance with instructions, providing answers in any of a series of specially designed forms.

Personnel Training—conduct periodic training sessions on advance computer techniques for those with particular problems.

The modus operandi to be followed by the Center in delivering the solution to an operating problem in the required format to a requesting division will consist of investigation, counsel and programming. After the initial request for assistance is made by an authorized person in a division, the Center will send a qualified analyst to visit the recipient to discuss the problem thoroughly. His job, essentially, is to determine exactly what the recipient desires as the end product. Several visits and conferences may be necessary to explore adequately the problem and to devise the various programming techniques that might be used.

Next, the analyst will write a brief, concise report advising the recipient of the suggested approach to solving his problem, the estimated time required to complete the job and a description of the output report.

Upon acceptance of the proposal by the recipient, the analyst will gather all pertinent information and draw logic diagrams, breaking down the problem into its elementary components. In a blast furnace simulation problem, for example, the analyst must be confident that the computer presentation of the physical system will balance the various heat requirements for specific input materials with the heat available in the furnace.

At this point, the recipient will be consulted again and informed in general what he is to receive after the problem is run on the computer. If changes are necessary, they will be made.

Catalyst for the corporate team

The logic diagrams will then be turned over to the application programmers, who will prepare the detailed computer block diagrams. These specialists must decide which programming system to use to meet all objectives outlined by the analyst. For example, in business data processing, the programming system must be sufficiently sophisticated to provide for an ever-changing pattern of information for intelligent decision-making.

The program is then coded, punched into cards, verified and returned to the programmers for testing. Normally, all programs require a debugging session which involves intensive computer testing and correcting to insure the desired results. After this, the results will be produced in the form desired by the recipient, whether this be printed copy, punched cards or magnetic tape.

Summarizing the functions of the Management Services Department, Mr. Baker explained that its principal effort is to "bridge the gap between those who do the actual computing and those who have the problems."

His group functions as a catalyst on the corporate team. Their knowledge—the knowledge of specialists—is made available to the people within the corporation, promoting a fuller appreciation and understanding of the various machines and their attendant capabilities. ■

Armed Forces Standardize Microfilm

Engineering Data Micro-reproduction System Covers Films, Punch Cards, Aperture Cards

The Armed Forces, operating active files containing more than 50 million drawings, have set military requirements for microfilming engineering drawings and related data.

The standards and specifications released April 15, 1960, by the Department of Defense for its Engineering Data Micro-reproduction System establish uniform methods for microfilming and standard formats for data presentation.

These uniform methods and standard formats, the Defense Department said, offer great space, time, and money savings.

New possibilities for inter-service exchange of engineering data are opened through the use of microfilmed drawings and related data, the Department of Defense announced.

What does this mean to industry?

Military agencies using the specifications of the Engineering Data Micro-reproduction System will ask contractors to submit engineering data in 35mm roll microfilm and punch cards. From the microfilm and punch cards, such military agencies make aperture cards to distribute engineering data for the procurement, maintenance, and supply of the nation's weapons systems.

In addition, other military agencies may require contractors to submit completed aperture cards. In these cases, the master microfilm and distribution copies are furnished in mounted aperture cards.

Even now, a number of prime contractors and sub-contractors are using a portion of the newly-adopted specifications and standards. For them, the new requirements will be integrated into existing programs.

Many contractors, anticipating the standards and specifications, have held microfilm programs in abeyance. Their engineering departments now have a ready-made set of instructions for upcoming programs.

The new standards and specifications are expected to have a cumulative effect. As more companies have microfilm equipment, industry will intensify its use of microfilm for distributing data. Even before specifications were announced, prime and sub-contractors were exchanging engineering data in microfilm format.

Industry helped set standards

Compatibility with industry is the keystone in the new standards and specifications of the Department of Defense. Industry originates much of the engineering data used by the DOD. Industry, in helping to set requirements, has created instructions that can be used for its own operations.

Standards cover broad areas

The standards and specifications documents already released are:

MIL-M-9868, Microfilming of Engineering Documents, 35mm Requirements for;

MIL-P-9879, Photographing of Construction/ Architectural Drawings, Maps and Related Documents, 105mm, requirements for;

MIL-C-9877, Cards, Aperture;

MIL-C-9878 Cards, Tabulating and Aperture for Engineering Data Micro-reproduction System;

MIL-STD 804, Formats and Coding of Tabulating and Aperture Cards for Engineering Data Micro-reproduction System;

MS-21319, Gage, Aperture Cards No. 201-1.

Interim Federal Specifications cover silver halide, diazo-type, and heat developing microfilm.

The complete Department of Defense standards and specifications cover:

- The raw film stock used in microfilm;
- The methods and techniques of microfilming engineering data for the Armed Forces;
- The formats of the tabulating cards used to generate aperture cards;
- The formats of the aperture cards used as carriers for the microfilm data;
- The methods and techniques of mounting microfilm into aperture cards;
- The wide range of equipment to be used in the micro-reproduction system. This equipment includes microfilm cameras, testing equipment to inspect filmed engineering data, film mounters, film printers, and print-out units.

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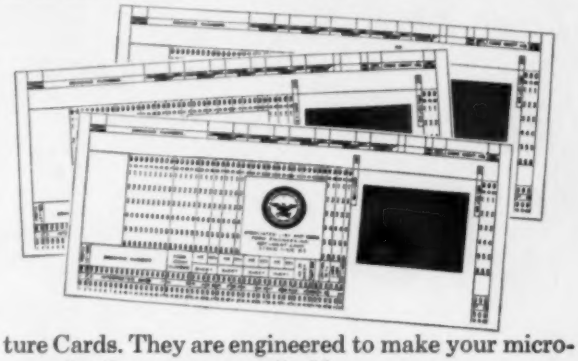

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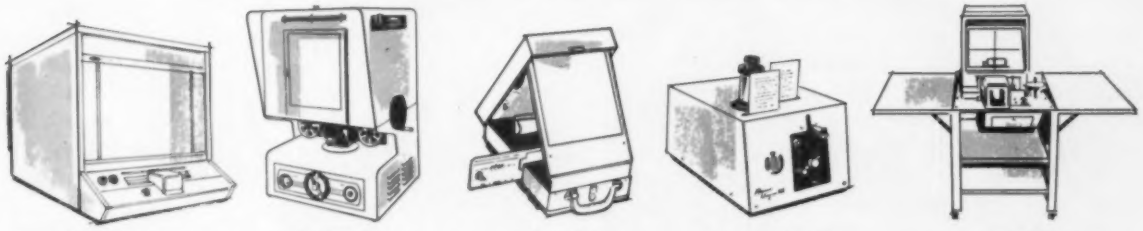

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For More Information Circle Reader Service Card No. 166

Test Computer System Designed To Control Nation's Air Traffic

The programmer's console in the foreground and computer at the rear are integral parts of a new air traffic control system now under study at the Federal Aviation Agency's Experimental Center in Atlantic City.

An MBA News Feature

THE FIRST computer system designed specifically to gather, compute and display flight data as an aid to the nation's air traffic controllers is now undergoing testing at the Federal Aviation Agency's Experimental Center in Atlantic City, N. J.

The Computer system, called Data Processing Central, has been developed for the FAA's Bureau of Research and Development by GPL Division of General Precision, Inc., with associate contractors, the Librascope and Link divisions of General Precision, Inc. and Tasker Instruments Corp.

When programmed for the New York area, as an example, the computer would be able to process and print up to 1,600 flight progress strips per hour, process 440 flight plans per hour and store a total of 1,000 flight plans. If necessary, it could sequence the arrival or monitor the departure of a total of 90 aircraft per hour.

Using Data Processing Central equipment, controllers will be able to enter manually or automatically into the computer a variety of flight plan information, such as time and place of flight departure, destination, and flight route. Computations will be completed and information presented to appropriate controllers automatically through an array of display consoles. The air traffic control can initiate message transfer between the core memory of the computer and as many as 30 of these "sector" consoles. (Each air traffic center's area is dividing into individual sectors with its associated console.)

In flight operations, aircraft pilots signify their intention to depart by submitting time and place of both departure and destination, together with airway designation or direct flight route. The proposed flight will be provided to the computer by teletype, through a buffer that encodes the plan.

The computer will then detail the flight plan to determine navigation check points over which the aircraft will fly and will estimate the time of arrival over these check points. It determines if there is any possibility of a conflict with any other aircraft in the area by searching the file storage unit for flight paths of other aircraft under control. If conflict exists, the computer causes the display panels to indicate this condition to the traffic controller who then makes a more suitable, alternate decision.

Program and control information is transmitted to the central computer by Friden Flexowriter, high-speed tape or remote keyboard. Sector controllers have keyboards for data entry.

Because it was designed specifically for this operation, the new computer is said to provide a higher degree of safety and reliability of information handling than other computers. Once the testing is completed, it is expected that the Data Processing Central equipment will replace computers now operating in specialized air traffic control function at several major airports (MBA, July '59). It may someday help to coordinate the efforts of some 13,000 air traffic controllers in the nation who are responsible for the safe and orderly flow of thousands of aircraft.

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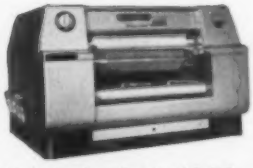

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Yearly registration at Penn State University taking place in the gymnasium—a system to be replaced by the computer.

Data Processing Goes to College

ADVANCED data processing techniques at the Pennsylvania State University are heralding a new era in university business practices.

At Penn State, both a punched card and a random access-tape computer system are helping to solve many complex campus business and academic problems. Experience gained here may aid other colleges and universities in the solution of their mounting financial, personnel and administrative problems.

Carl R. Barnes, controller of the Pennsylvania State University, explains the system this way: "Since World War II university financial operation has required big business techniques. The new IBM RAMAC 650 tape system at Penn State is another advanced business tool with which to do our job. The computer provides the speed and flexibility we need to probe into and study many areas of our operations. And what we learn from these studies will aid in providing better service and facilities to faculty and students."

During the past year a full-time faculty of 1,905 scientists and teachers was required for the education of 17,209 undergraduates, the professional training of 2,056 graduate students and the conduct of 740 research projects. The maintenance of a program of continuing education carried the resources of the campus to a million more individuals and hundreds of groups throughout Pennsylvania.

In dollars and cents, Penn State's operation is larger than many so-called "big businesses." The extensive plant of the University, located throughout Pennsylvania, represents an investment of $109 million. Payroll to maintain and run this plant is over $27.5 million a year. Accounts payable alone amounts to $1.5 million a month. The Accounting Department of the University writes more than 20,000 checks every 30 days.

During the next 10 years, it is expected that almost every one of these figures will double, as each year in Pennsylvania, as elsewhere in the nation, more and more qualified students seek a college education.

Electronic integration

In data processing terms, the computer will permit integration of all student and business matters. Rather than having vital information scattered throughout the campus under many different systems, all data will be located on the magnetic tape reels or disks of the computer in one central location. With this information compactly located, the computer can be used for rapid accumulation of results, reports and studies. The system will obviate the need for multiple files, eliminate duplication of effort and generally reduce the size of the clerical staff needed for routine and special work.

The recently installed system consists of an IBM 650 computer, six tape drives, two input-output units, a 407 Accounting Machine and three RAMAC units. Auxiliary equipment includes the 720 high speed printer which complements the speed of the 650 tape system.

As a business tool, the system will interlock data concerned with all phases of accounting at the University. Budgetary controls, accounts payable, payroll, and general ledger information will be maintained.

In the case of an accounts payable item, for instance, the basic source data will be punched cards and then fed into the 650. The computer will extend the information, check it, apply it to the correct budgetary account and list the results on the appropriate output tape. Remittance notices and statements then will be written from this tape.

The same processing "run" also will cause the data to be included on reports which go to the administration, agencies, departments and personnel of the University.

Lifting a staggering load

One result of the system, Barnes says, is that every budget dollar will be expended in the best possible manner. "A prime purpose of the Accounting Department at Penn State is to put the money available to the best possible use. And, unlike a commercial enterprise, our problem is to use all funds available in the best interest of the faculty and students, not to accumulate a profit. The current information which we'll be able to obtain out of our computer will help us to maintain extremely tight budget control over these disbursements."

Barnes cites a study of student grades as one possibility for the computer. "Recently we utilized our card files to find out what effect elective and culture courses have on the grades of the solid science students in engineering, chemistry, and physics. This study required an analysis of 84,854 semester grades given by 115 departments in 62 student curriculums." Getting at this information, however, required time, expense and manpower. With limited time and funds available for such work, only a comparatively small amount of information can be derived from the card files. The new system simplifies the job of getting at this type of information. "With student data compactly located on tape or in the units," Barnes says, "we can pick out what we need rapidly and economically."

Other possibilities in the system would be to program the computer for determination of applicant eligibility. Presently all applications for enrollment at Penn State are processed manually, even though half are definitely eligible, four tenths definitely not eligible and the remaining one tenth in the "decision" area.

In a computer system, application data could be recorded directly onto tape or disk. The computer, responding to programmed instructions, will segregate the qualifying and non-qualifying students. The one tenth falling in the "gray" area then would be written out by the computer as exceptions for admissions personnel decision.

Carrying through with this system, all following data pertaining to a student could be recorded on tape or disk. From this horizontal channel of source data all the necessary reports, notices, class assignments, residence hall assignments and other paper associated with student activity can be prepared. Through the student's campus life—and even on into alumni status—the computer system can form a central file for every bit of student information. A result will be easing of the great clerical task presently borne by the University and much better all-round service to students and faculty.

The new system at Penn State is an advanced tool to relieve the University of a staggering burden of work. Computers of today and tomorrow should find a ready home on campuses throughout the United States. No matter how you look at it, a university is big business. ■

The IBM RAMAC 650 Magnetic tape system being used for general accounting and student work at Penn State.

THE CARD WITH SPECIAL BACKING

...in service

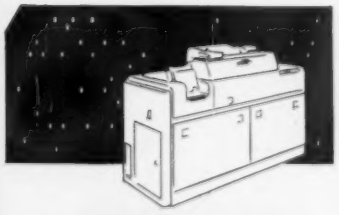
Complete service is important with any product and, in fact, greatly increases its worth. Behind the IBM card stands an organization that is geared to render this kind of service.

For *expert advice* and *technical assistance* with your card problems, you can always rely on the IBM Sales Representative and IBM's staff of Supplies Specialists. These men are thoroughly versed in *both* card and machine requirements.

IBM's *warehousing service*—for customer and stock card forms—permits faster delivery and practically eliminates "out-of-stock" conditions in customer inventories. *Pool shipments*, for less-than-truckload card orders, are arranged automatically by IBM whenever possible. In addition, *emergency* service is always available. Whatever the format, quantity or delivery time required, IBM will do everything within its power to meet your needs. *Customer education* in the design, handling and care of punched cards is available through IBM's customer education centers, as well as through plant tours, supplies seminars and informative books and pamphlets.

The IBM card is backed by unmatched DESIGN and QUALITY, too. Through Card Design Centers . . . Sample Card Centers . . . manufacturing experience and quality control which are unparalleled in the industry . . . you receive the finest in card design and performance.

This special backing makes the IBM card a *value* unsurpassed in the industry . . . and represents one more example of the way IBM helps you to enjoy Balanced Data Processing.



IBM®

SUPPLIES

Prototype of the new Comex 104 high-speed transmission communication system in operation at the Westinghouse Electric Corp. A.T.&T. data sub-set and Kleinschmidt tape punch and teletypewriter complete the system.

Westinghouse Inaugurates Comex System

An MBA News Feature

MOVING shipments of home appliances from factories to distributors and dealers 24 to 48 hours faster than was previously possible is the achievement of a new high-speed data transmission system installed by Westinghouse Electric Corp.

Using a combination of the new Avco-Crosley "Comex" system (MBA, May '60), teletype and A.T.&T. data sub-sets to link manufacturing, depot and sales operations at three appliance plants, the company has speeded up both shipping and billing procedures.

Westinghouse recently opened a nation-wide appliance depot network keyed to a huge (700,000 square feet) depot in Columbus, Ohio, another near Ogden, Utah, and dozens of smaller satellite warehouses around the country. Factory warehouses at major plants in Mansfield, Ohio, and Springfield, Mass. are administratively part of the new depot at the Columbus plant.

All orders for shipments either to distributors or dealers of full cars of one appliance or cars with mixed appliances go through the Columbus depot. Since it is often more practical to ship directly from Mansfield or Springfield, the use of the high-speed system to transmit shipping information has cut from one to two days from the regular procedure.

An operator punches out the shipping papers and bill of lading information on a teletype tape which is fed into the Comex unit. At regular schedules each day, direct telephone line communications are made between each plant and the Columbus depot. During this time, the information on the tape is sent over the telephone lines at 10 times the speed it was recorded. Comparable equipment at the receiving end converts the electrical impulses onto high-speed tape and this is then played at slow speed (100 words a minute) into a teletype tape punching device. The punched tape, in a teletypewriter, then automatically prints the data on a combination shipping paper and bill of lading.

When the merchandise is shipped, verification is transmitted from the shipping factory to the Columbus depot by the reverse process—meaning billing has been accomplished from 24 to 48 hours ahead of the previous method.

Frank Ford, manager of business systems and services for Westinghouse, said the use of the new system "far outstrips any other known system for rapid transmission of this type of information."

"It is the first practical equipment we have found to be satisfactory for our type of operation, and its possibilities are limitless in assembling and distributing all types of sales information," he concluded.

The NCR 390 system pictured here consists of a central processor, a console, units to read punched paper tapes or punched cards used as input media, and auxiliary equipment to create punched paper tape, punched cards, and control other peripheral equipment.

NCR 390 Computer Accepts Ledger Cards As Direct Input

An MBA Product Preview

DESIGNED with ability to "read" and process a magnetic-coated ledger card, the NCR 390 computer has added a new input concept to the conventional forms of punched cards, punched tape, magnetic tape and manual keyboard entry.

Built by National Cash Register Co., the 390 will enable business firms to keep traditional "hard copy" records which can be read instantly by employes yet serve as direct input or output for a computer system. The magnetic coatings, consisting of four vertical strips, "remember" pertinent data regarding a particular account and also tell the computer how to handle the account. The front of the ledger card looks exactly like any conventional business form and contains the normal printed information.

The NCR 390 is a complete system which sorts, summarizes, compares, makes decisions, calculates, accumulates, updates balances, handles exceptions and controls auxiliary equipment electronically. It is completely transistorized and has a 200-word magnetic core internal memory and internally-stored programs which can be varied at will without the use of pinboards or plugboards. The computer has four types of input—punched cards, punched tape, keyboard and the unique magnetic ledger cards, all of which can be used simultaneously. It also has four types of output—the ledger cards, punched cards, punched tape or machine printed forms.

The ledger card in the young lady's hand is direct input for the new 390 computer. Magnetic strips placed on the back of the document can be "read" and remembered by the system.

The system's punched paper tape reader can decipher data entered into the computer at speeds up to 400 characters a second.

Stanley C. Allyn, NCR board chairman, termed the development of the system as a "major breakthrough" in extending electronic data processing to more businesses at a lower cost. Using the magnetic ledger cards, the computer can prepare a complete payroll—including paychecks and all necessary records—for a firm of 1,000 employes in half a working day. Taking information from the magnetic ledger cards, it makes all calculations and prints out the required documents and records, updated and ready for the next pay period.

Basic price on the new system is approximately $75,000. Rental is $1,850 a month. Circle No. 109

New from Royal Precision... RPC-9000

THE LOWEST-PRICED COMPLETE DATA PROCESSING SYSTEM ON THE MARKET TODAY!

Economical design: The new, completely-transistorized RPC-9000 is designed for serial mode of operation. This feature utilizing magnetostrictive delay lines for high-speed memory permits great reduction in original equipment costs. Tape transports using continuously revolving loops of magnetic tape rather than "start-and-stop" techniques further cut initial investment.

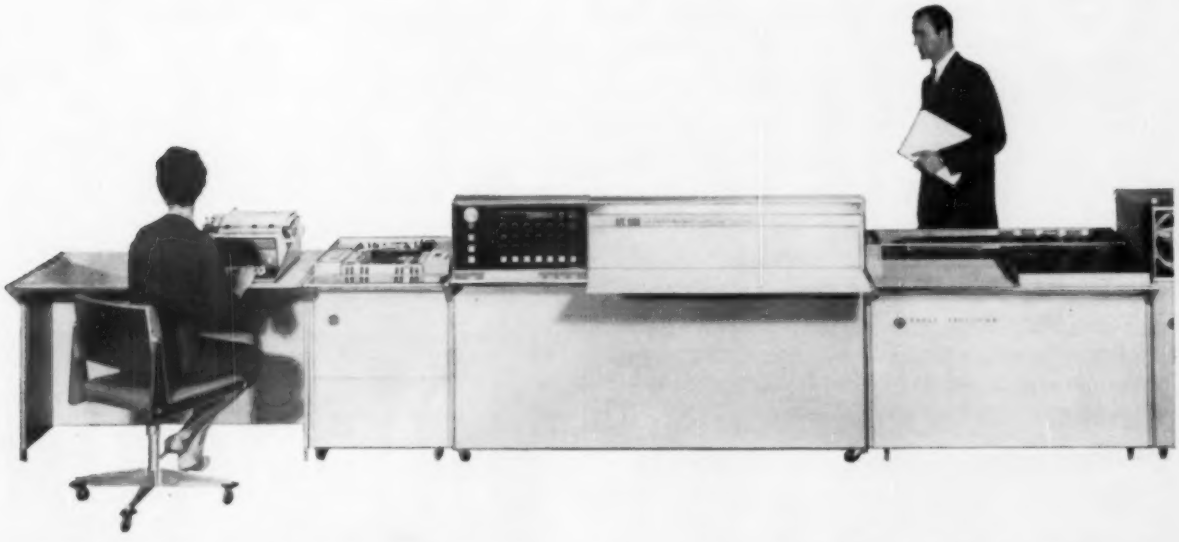
Efficient operation: The RPC-9000 processes data "in line." Data are accepted in random order, and all affected records are automatically updated in a single uninterrupted sequence of operations. No batching or sorting is necessary. Data are recognized by content, not location. This eliminates the need for location codes, and allows efficient utilization of storage capacity. Eight separate records are searched simultaneously. Completely buffered input-output permits simultaneous operation of all system components.

Tailored to your needs: With the RPC-9000 you buy the exact amount of data processing you require. Start with the basic system—computer, tape-typewriter, magnetic tape storage unit. Then, as your volume grows, you can add high-speed paper-tape punches and readers; punched card readers; line printers; additional tape typewriters; more magetic tape cartridges; more internal memory. You can operate up to 30 of these devices at the same time.

Economical in use: The RPC-9000 is designed for ease of operation and maintenance. It uses power from any ordinary wall outlet, requires no air conditioning or site preparation. This low-cost system will perform the full range of your data processing needs. See your nearby Royal McBee Data Processing Systems Sales Representative without delay, or write to the address below for comprehensive brochure.

Royal Precision Corporation

Royal Precision—producers of the LGP-30, the RPC-4000 and the RPC-9000—is jointly owned by the Royal McBee and General Precision Equipment Corporations. Sales and service are available coast-to-coast, in Canada and abroad through Royal McBee Data Processing Offices.



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If you have sales ability, and are interested in electronic data processing contact your nearest Royal McBee Data Processing Office, or write Sales Administration Director, Royal McBee Corporation, Port Chester, New York.

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Diebold Power-Filing saves time because records come to your personnel . . . personnel don't waste time walking to records. Diebold Power-Filing saves effort because electricity does the hard work . . . brings thousands of records within fingertip reach in three seconds. Operator works in comfortably seated position . . . facing records for greater visibility, reach and accessibility.

And Diebold Power-Filing saves space . . . in many cases housing far more cards in less floor space than other record-handling methods.

These are but three of the many advantages you can enjoy with Diebold Power-Filing, whether your operation involves 2,500 or millions of records. For details on how Diebold Power-Filing can expedite your record-handling procedures, use the coupon below. There's no obligation.

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For More Information Circle Reader Service Card No. 169

The 609 Calculator is a high-speed, punched card machine capable of multiple job handling in a single run.

An MBA Product Preview

IBM 609—Compact Punched Card Calculator

SOLID-STATE circuitry which combines the functions of input, calculation, storage and output in a single compact cabinet is the achievement of the IBM 609 introduced as the "lowest priced solid-state punched card calculator ever to be offered on a commercial basis."

International Business Machines Corporation's Data Processing Division announced the new machine rents for $1,175 a month and sells for $55,500.

Termed a general-purpose electronic calculator, the 609 can be used for accounting and control applications as well as for engineering problems. It was designed to work with all types of punched card equipment and can function as the heart of an installation tailored to individual requirements.

The basic unit, housed in a cabinet 60 inches long, 29 inches wide and 50 inches high, is equipped with 80 program steps, each of which is capable of performing three separate operations. Additional steps may be incorporated in increments of 16 to a maximum of 144. These program steps are non-sequential, permitting the 609 to make logical decisions as to what steps should be used to solve a problem without regard to their sequence. In many cases this eliminates multiple machine runs.

The unit is equipped with 240 positions of magnetic core memory storage which can also be increased—up to 384 positions. Input-output rate is 200 punched cards a minute, with a card-feed hopper capacity of 1,200 cards. Three non-stop radial stacker card pockets each hold up to 1,000 cards.

Indicator lights on the display panel show the complete operational status at any given moment, providing a means of communicating with the machine. The 609 is programmed with wired control panels which are easily and quickly changed when switching from job to job. Circle No. 120

"We Have No Machine That Thinks!" John Diebold

"Expressions such as 'electronic brain', which implies that electronic computers have the capacity for thought, are like most facile descriptions of new scientific developments . . . they are usually half-truths. 'Horseless carriage', 'wireless telegraphy' and other adroit coinages of preceding eras were perhaps as effective in obtaining public acceptance. . . . But they, too, were no nearer the essential truth. The important feature of the new carriage, was not its horselessness but the fact that it employed a specific new machine. . . . Most of the confusion results from the fact that language has to catch up with scientific developments. Automation itself suffered from this vagueness until the concept became fixed in the finally-accepted word. Even the word computer is hopelessly inadequate in describing what the machine is. In the broadest sense that we use the word think, it can safely be asserted that we have no machine that thinks.

The accounts that describe the new machines in human terms neglect one very important fact. Free will, the essential human quality, is absent from all of these machines. In no way can this quality be attributed to any machine yet developed, nor is there any indication that any such machine could be developed." John Diebold, president, John Diebold & Associates, Inc., management consultants.

'Electronic Brain' *Continued from page 28*

he and his colleague, Dr. Rosenblueth, co-founded the new science — Cybernetics. Defined as "the comparative study of the control system formed by the nervous system and the brain and mechanical-electrical communications systems, such as computing systems," Dr. Wiener wrote his first book on the subject, "Cybernetics", in 1948. The book explains that his approach to computer technology not only utilizes intricate mathematics to simulate the nerve "synapse" in the brain with electronic "switching" devices of ferrite rods in the memory core of the computer, but that the physiological, chemical, biological and psychological aspects of "thinking" must also be understood. This attempt to explain the new science to fellow scientists and the interested public, because of its technical nature, found more of an audience among the scientists.

Realizing his first book was not accomplishing its mission with the public, and fired by the idea that computer advancement could result in some dire social consequences, Wiener in 1951 wrote another book entitled "The Human Use of Human Beings." In this book he explained his science less technically and delivered pointed warnings that if a man chose to use these highly developed machines to destroy each other in war or to exploit each other in business then civilization would be destroyed. He stressed the point that unless everybody fully understands the capabilities and potentialities of the computer then it will be impossible to control its impact on society.

Eight years later Dr. Wiener still hasn't changed his view of the consequences of the scientific, business, industrial and especially military use of the computer. The gospel of "heed" was again preached on December 27, 1959, when Dr. Wiener spoke before the American Association for the Advancement of Science stating: "In my opinion the assumption that machines cannot possess any degree of originality should be rejected . . . It is my thesis that machines can and do transcend some of the limitations of their designers, and that in doing so they may be both effective and dangerous . . . they act far more rapidly than human beings, and are far more precise in performing the details of their operation." His main fear now seems to lie in the use of the computer in defense systems. Anti-missile missiles poised to instantly and automatically counter-attack enemy projectiles may well be a part of the U. S. defense program this minute. To this Wiener says, "It is not enough that some action on our part should be able to change the course of the machine, because it is quite possible that we lack the information on the basis of which to consider such an action." Though Dr. Wiener's speech was perhaps a sincere attempt to warn scientists and the public-at-large of some of the dangers associated with the advancement of computer technology, it was grossly distorted by the press, news-wise and editorially. Scare headlines about "electronic brains" taking over man's thinking appeared the next day, with no apparent attempt from Dr. Wiener to avert or modify them. Surely no one man has unintentionally done more to inspire and foster the myth of the "electronic brain."

Brains change their minds

A subtle change in the approach to computer utilization became apparent among scientists at the 1955 Institute of Radio Engineers National Convention, where the Professional Group on Electronic Computers sponsored a symposium on "The Design of Machines to Simulate the Behavior of the Human Brain," to exchange their ideas on the subject. One thing established in the discussion was that a "distinction must be made between simulation of *structure* and simulation of *function*." It was further decided that "computers could not be considered structurally similar to human brains, and that the simulation of brain structure by a machine structure is not a very promising enterprise."[4]

Dr. Mortimer Taube, president of Documentation Inc., working toward simulating function, (at the same time as von Neumann and

Wiener were working on simulating structure), took the advanced attitude on the basis that "the proper man-machine relation is one of complementation and augmentation, *not* simulation." His reason is that, "The organs which convey messages to man's brain and the brain itself are biologically specialized to function in an earth-bound environment. Of even greater significance is the fact that these organs evolve through millions of years by a process of natural selection to perform certain activities necessary to the survival of the species man in his natural environment."[5]

The applied scientists had been engaged for years in the utilization of the computer on the basis of function, in order to get the most use out of it as a business tool in practical application. Working for the computer manufacturer, their approach was and is most pragmatic. Taking the computer on its own grounds, they are free to use their imagination in putting it to work for business. Applied scientists were early in setting computers up for a host of linear business decisions. A simple comparison involving known facts, non-variable information, can be made with ease. In the very near future it is expected that involved inventory control problems such as order fulfillment, can be calculated completely automatically. Taking the quantity of the product desired, with the amount available in stock, the rate of production, the price scale and available shipping dates; complete order processing will be done without intervention. In this case all information is definite and a formula can be set to control and communicate the entire order.

New ways to think

The only barrier to limitless computer decision making is not with the equipment but with the lack of human imagination to set up the required formulas. This is true particularly in such areas as market research. A good illustration of the difficulty in setting up such equations is shown in prediction of sales on the stock market.

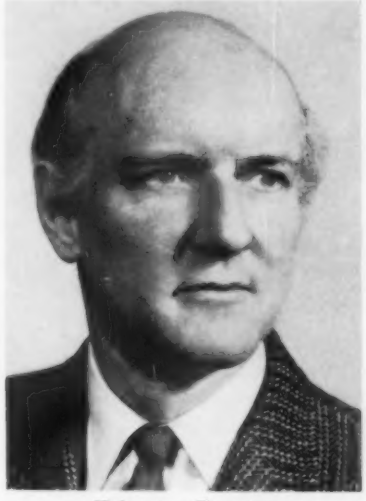
Who could formulate the whims and caprices of stockbrokers marching down to Wall Street, when the morning headlines, the weather or a marital squabble can

(Continued on page 48)

In Answer to the Question—Can or Will Machines Think For Themselves?

Peter H. Greene

"Present day machines are beginning to get away from a lack of independence and creativity by designing computer languages and programs which themselves design more powerful computer languages and programs. If this trend continues, as I am sure it will, we shall soon have machines that operate in a subtle language unknown to us, which we could not even detect, because it would depend upon unknown relationships among all the electrical impulses. . . . Then we would say that 'there's lots behind the lights' that we did not build into the machine—the machine would be doing things 'for itself'." Peter H. Greene, Committee of Mathematical Biology, Univ. of Chicago.



Heinz von Foerster

"That systems as irrational as ourselves, only a 'little bit better', can be constructed today has been clearly shown by the English logician Dr. Ross Ashby, who proved once and for all that one can build a chess player which would outplay its designer. . . . Because such systems can outplay their designers, they must perform operations which were not laid down — or can not even be understood—by those who constructed them. Hence they must have 'thought-up' those things by themselves." Dr. Heinz von Foerster, Department of Engineering, Univ. of Illinois.

John W. Carr, III

"A. M. Turing has proposed as his definition of the word 'think', in the case of a machine, the ability to carry on successfully an 'intellectual' conversation with a human, so that the human cannot tell that it is a machine with which he is talking. With this definition, I would guess that machine 'thinking' is over 25 years away. Machines now solve complex decision problems, prove simple mathematical theorems, perform low-level language translations, and compose rather low-grade music. I would predict that machines will be performing more complex intellectual activities each year." John W. Carr, III, director, Computation Center, Univ. of North Carolina.

alter their whole buying attitude? As soon as some brilliant economist formulates these unpredictable factors, then the computer too will calculate all this data and make accurate predictions.

The main advantage of the function simulation approach is that it frees the applied scientist to think in new ways. He has learned to take advantage of the machine's own specialized characteristics: vast memory capacity; great speeds of manipulation; constant calculation for routine manipulation (the machine is never tired or bored; perfect accuracy in optimum operation (and it can check itself); capacity of erasing its whole memory and be programmed for entirely new problems and data, providing greater flexibility; it can dwell on extensive data simultaneously; its behavior is invariant; it is uninfluenced by extraneous pressures (i.e., emotions, psychological disturbances, worries, traditions etc.); it has no preconceived ideas; it has a pattern of organization which can check or change itself; and it retains constant proficiency. With this variety of special abilities applied scientists have devised amazing applications and will tackle more and specialized problems in the future.

A complete surprise

The ironic fact is that although the computer is not an "electronic brain," it can still do more and more things that were once exclusively limited to the brain. The ability of a machine to simulate human reasoning power in finding logical proofs for theorems in Euclidean plane geometry, such as most high school students learn to do, has been successfully demonstrated by Dr. Herbert L. Gelernter of the Programming Research Department at the IBM Lamb Estate Research Center. Programming an IBM 704, Dr. Gelernter and his intelligence group, simulated a machine capable of discovering proofs without resorting to exhaustive enumeration of proof sequences or a decision procedure.

Another event in scientific communication of computer development was the UNESCO sponsored International Conference on Information Processing held in Paris June 1959. Dr. Gelernter presented a paper concerning the machine described above, pointing out that "the machine has produced a proof on several occasions that was a complete surprise to its creators." He goes on to say that the machine's proofs are no more significant than the student mathematician under the influence of his professor. When learning is introduced to the machine, prediction of it response will be uncertain; but it still is no more than a partial decision making machine. But the human brain is *also* only a partial decision maker. The paper goes on: "The gross behavior of the machine has been carefully programmed into it by having the machine imitate what seems to be the problem-solving behavior of people, so that the old cliche, 'machines can do only what we tell them to do' is still very much the present state of affairs. What is new is that we are learning to tell the machines to do things that until now seemed to require the agent of human intelligence."[6]

No more "brains"

At the same conference A. Newell and J. C. Shaw of the RAND Corp. and H. A. Simon of the Carnegie Institute of Technology delivered a paper describing "a program for a digital computer called General Problem Solver I (GPS), which is part of an investigation into the extremely complex processes that are involved in intelligent, adaptive, and creative behavior. Our principal means of investigation is synthesis: programming large digital computers to exhibit intelligent behavior, studying the structure of these computer programs, and examining the problem-solving and other adaptive behaviors that the programs produce."[7] The actual program would require Newell, or one who understands all its technicalities, to reduce it to a level the public could understand. Nonetheless the achievement is considered the most significant work being done in making it possible for machines to begin planning *how* decisions should be made, rather than merely making them. The distinctive thing about these programs is that they require the machine to use inductive reasoning, rather than the usual deductive pattern. To date, these uncanny machines of Gelernter and Newell represent the most advanced experimental realities in this country.

The evolution of the computer as a thinking aid has been the result of creating and developing a unique machine "structure" with special capabilities to suit human needs. On this basis, the computer has been ingeniously programmed to demonstrate remarkable proficiency in supplementing some of the functions of the human brain. With this summation, let us hear no more about "electronic brains." ■

Footnotes

1. "Man's Expanding Mind," published by Librascope, Inc., Glendale, Calif., 1959. Lewis W. Imm, president.
2. Kappler, M. O., president System Development Corp.; from "Management Control Systems," published by John Wiley and Sons, Inc., New York, 1960.
3. Von Neumann, John; Silliman Lecture, "The Computer and the Brain," Yale University Press, New Haven, Conn. 1957.
4. Oettinger, A. G.; "Symposium: The Design of Machines to Simulate the Behavior of the Human Brain," p. 241, IRE "Transactions on Electronic Computers," Dec. 1955, p. 240-255.
5. Taube, Mortimer, President, Documentation Inc.; "Man-Machine Relationships," Datamation, Jan./Feb. 1959, p. 18-19.
6. Gelertner, H.; "Realization of a Geometry Theorem-Proving Machine," paper presented at the International Conference on Information Processing, Paris, France, 1959. Also see "Empirical Explorations of the Geometry Theorem Machine," paper presented with J. R. Hansen and D. W. Loveland at the Western Joint Computer Conference, San Francisco, Calif., May, 1960.
7. Newell, A.; Shaw, J. C.; Simon, H. A.: paper presented at the International Conference on Information Processing, Paris, France, 1959. Published as "A General Problem-Solving Program for a Computer," Computers and Automation Magazine, July 1959, p. 10-17.

Applied science information, Dr. John L. Lawrence, International Business Machines, Corp.

An MBA Product Preview

'Findafact' Stores Punched Card Information on Magnetic Tape

The transistorized "Findafact" console, in foreground, is programmed by plugboards. Two tape stations, in background, can run simultaneously handling both input and output information.

THE new "Findafact" Model 2510 Data Retrieval System, featuring an economical solution to the problem of low density look-up on large data files, has been announced by Rese Engineering, Inc. Fully transistorized, the system is designed to maintain extensive files and provide rapid recovery of stored information from magnetic tape, using standard punched card equipment for input and output.

Employing one or more tape stations, such as the IBM 727, IBM 729 II or the Potter 906, Findafact transfers all punched card information to tape at speeds up to 40,000 characters per second. As many as 180,000 cards may be stored on each reel.

Inquiries to the tape file are made through standard card readers with an effective interrogation search rate as high as 20,000 entries a minute. With a file of 1 million cards on about six reels of tape, it is possible to retrieve 1,000 records in an hour's time.

One major feature is the system's use of two tapes running simultaneously during file maintenance operations, handling input and output at the same time. For checking, deleted or substituted records are delivered to the output, as well as any input deletion or substitution for which a matching reference number is not found in the original reference tapes.

Plugboard programming is used to control data flow and operating modes with no specially-trained personnel required for problem setup. All input and output data transfers are checked with redundant parity codes, preventing any undetected errors.

Data arrangement on the Findafact reference tapes is similar to that on punched cards. It consists of the following:

Characters, which include coded numbers, letters, punctuation marks and special symbols; Fields, which are analogous to those in a tab card and are determined by plugboard wiring; Records, which can accommodate either 20 or 80 characters, and Blocks, which are capable of handling twelve 80-character records.

The first installation of the system was made recently by General Electric Co. at its Switchgear plant in Philadelphia. Initial application includes retrieving bills of material and maintaining a standard cost file.

Other applications, according to Rese, which are suited to Findafact's economy and speed are magazine subscription fulfillment, stock transfer record updating, replacement parts costing and job shop production scheduling. Circle No. 125

Answering the call for quick copies

One minute at an automatic printer . . . seconds at an A. B. Dick Azograph® duplicator. Just that fast, Western Electric Company's Massachusetts plant produces all shop order paperwork for making the complex carrier systems used in central telephone offices.

Although this astonishingly intricate equipment involves many components produced at far-flung departments, Western Electric's one-writing shop order system requires just 15 copies to guide production, accounting and shipping. The patented A. B. Dick Azograph duplicating process was chosen to assure complete cleanliness, even when duplicating masters are passed from one department to another—and corrected or modified.

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For More Information Circle Reader Service Card No. 171

San Francisco, Hawaii to Host Annual NMAA Conference

Joseph L. Nuemiller, 1960 National Conference Chairman, compares the attributes of a modern computer with the ancient abacus, manipulated by Julia Lowe, attractive resident of San Francisco's Chinatown. The idea is to point out the attractions of San Francisco to members of the NMAA who are planning to attend the conference.

A "Golden Gate" welcome has been promised to members of the National Machine Accountants Association who will meet in San Francisco for the 1960 National Conference, June 22 to 24.

The program itself actually gets underway on June 21, with a special "Tours for Tuesday" feature for members who arrive early. The tours will cover data processing installations in and around the San Francisco area. Pacific Gas & Electric Co., Bank of America, Firemen Fund Insurance Co., Schlage Lock Co., and S & W Fine Foods, Inc. are among the plants that will be visited.

For those who are planning to take advantage of the full-scale program, the Pan-Pacific Seminars will follow the regular convention schedule, beginning June 27 in Honolulu, Hawaii. Those participating will fly to Hawaii on June 25 and return on July 2.

Two days of business seminars will be surrounded by several days of island tours and special parties for both members and their wives.

The actual conference and exhibit will get underway at 9:30 a.m. on Wednesday, June 22. George Christopher, mayor of San Francisco, will offer the official welcome, and John S. Woodbridge, controller of Pan American World Airways, will deliver the keynote address, "The Human Factors in Business Electronics."

Wednesday afternoon, Thursday and Friday will be dedicated to seminars covering applications, equipment and management and general education. Wednesday has also been slated for a series of industry forums, covering public utilities, banking, transportation, insurance, government, retail stores and other major businesses.

The President's reception, honoring D. B. Paquin, national president, will take place on Thursday evening, prior to the main banquet.

The election of national officers will be held on Tuesday during the annual meeting of the National Board of Directors. Those nominated for 1960-61 include: L. W. Montgomery, Shreveport, La., president, and W. C. Andrews, Jr., San Francisco, executive v-p.

Nominated for the newly created offices of vice presidents at large are John Brandt, Philadelphia chapter; E. Phillip Daro, North Jersey; Robert S. Gilmore, Long Beach; Elmer F. Judge, Wichita; H. G. McIntosh, Detroit; Carroll D. Parry, II, Columbus, and A. A. Ziegler, Northern Illinois.

Clyde DuVall, Chicago, has been renominated for the office of treasurer, and B. R. Purslow, Toronto, has been nominated as vice president in charge of the 1960 national conference in Toronto, Canada.

A group of 34 exhibitors will have displays in the California Masonic Memorial Temple.

New Executive Director

R. C. Elliott

R. Calvin Elliott has been appointed as executive director of the National Machine Accountants Association. According to an announcement by D. B. Paquin, National President, Mr. Elliott assumed his duties on May 16. He was formerly vice president and treasurer of Business Efficiency Aids, manufacturers of Magne-Dex and Magne-Tab visible systems.

For the truly modern Switchboard or Reception Desk... EDWARDS IN-DICATOR SYSTEM

entrance register

switchboard push button panel

Edwards new two-part In-dicator Unit keeps track of key office personnel. Telephone operators or receptionists can tell who's in at a glance, without wasting time or using noisy voice paging systems.

● when flipped, toggle switches on entrance register automatically indicate on wire-connected switchboard panel whether key personnel are in or out. ● individual office switches can be substituted for entrance register panel. ● both systems install easily and quickly.

EDWARDS Company, Inc., Norwalk, Connecticut
Edwards of Canada, Ltd, Owen Sound, Ont.

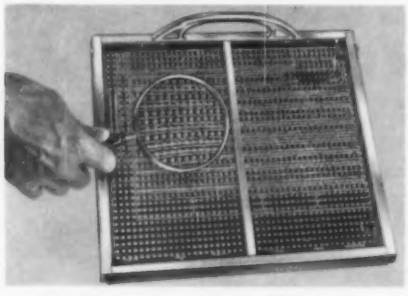
☐ Please send an In-dicator System descriptive brochure
☐ Please have an Edwards salesman call.

Name_____
Title_____
Company_____
Address_____

For More Information Circle Reader Service Card No. 172

NEW Self-Contacting Control Panels with Unmatched Legibility!

Easier to wire to check to change



Specially developed screening process, inks and paints give you unmatched clarity and larger characters, highest scratch resistance, long, trouble-free service. Plus these advantages: Aluminum frame and contoured handle lightness . . . plastic-light covers with thumb-pressure release . . . 24-hour shipping service . . . unconditional guarantee.

VPC

WRITE FOR COMPLETE DETAILS AND PRICES

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Post Office Box 1106
WAYNESBORO, VIRGINIA

For More Information Circle Reader Service Card No. 173

Salary Survey

Continued from page 25

Job Descriptions—Continued

SUPERVISOR OF COMPUTER OPERATIONS — Plans, coordinates and supervises the computer operation section engaged in operating the computer units. Schedules the utilization of all equipment in the computer operations section to obtain maximum use of the equipment. Assigns personnel to the various operations and instructs them where necessary so they are trained to perform assigned duties in accordance with established methods and procedures. Collaborates with other section personnel to coordinate activities or in the transfer of personnel to meet peak loads. Reviews equipment logs for accuracy, neatness, and equipment efficiency for the section.

COMPUTER OPERATOR, SENIOR — Under general supervision, monitors and controls an electronic computer that automatically processes data to solve mathematical, engineering or technical problems or to maintain business records, by operating central console. Studies program instruction sheet to determine equipment set-up and operating instructions. Switches auxiliary equipment, such as automatic typewriter and peripheral machines into circuit, to close loop and effect feedback of data. Manipulates control switches on console panel to start and operate electronic computer that reads and processes data. Observes, continuously, the lights on control panel, the magnetic tape units, and the action of automatic typewriter to monitor systems and determine point of equipment failure. Manipulates controls in accordance with standard procedures to rearrange sequence of program steps in order to correct computational errors or to continue operations when individual units of system malfunction. Confers with technical personnel in event errors require change of instructions or sequence of operations. Maintain operating records, such as machine performance and production reports.

COMPUTER OPERATOR-A—Under direct supervision monitors and controls an electronic computer on established routines. Assists higher level classifications in determining equipment settings and operating instructions. Manipulates control switches on console panel in accordance with established routine or under instructions. Observe, continuously, the lights on control panel, the magnetic tape units, and the like, reporting to supervisor any deviation from standard. May assist higher level classifications in manipulating controls to rearrange sequence of program steps to correct computational errors or to continue operations when individual units of system malfunction. Assists in maintaining operating records.

Continued from Page 24

North American Life, Golden State Mutual Life, Occidental Life Insurance Co., National Farmers Union, State Farm Mutual, Mutual Trust Life Insurance, Zurich Insurance Co., Lincoln National Life Insurance, Minnesota Mutual Life Insurance, Mutual Benefit Life Insurance, Equity Life Assurance, Ohio National Life Insurance Co., Chicago Title & Trust Co.

University of Minnesota, System Development Corp., State of Illinois, Minnesota State Civil Service, City of Detroit, City of Philadelphia, Milwaukee City Civil Service. ■

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GREATER SPEED

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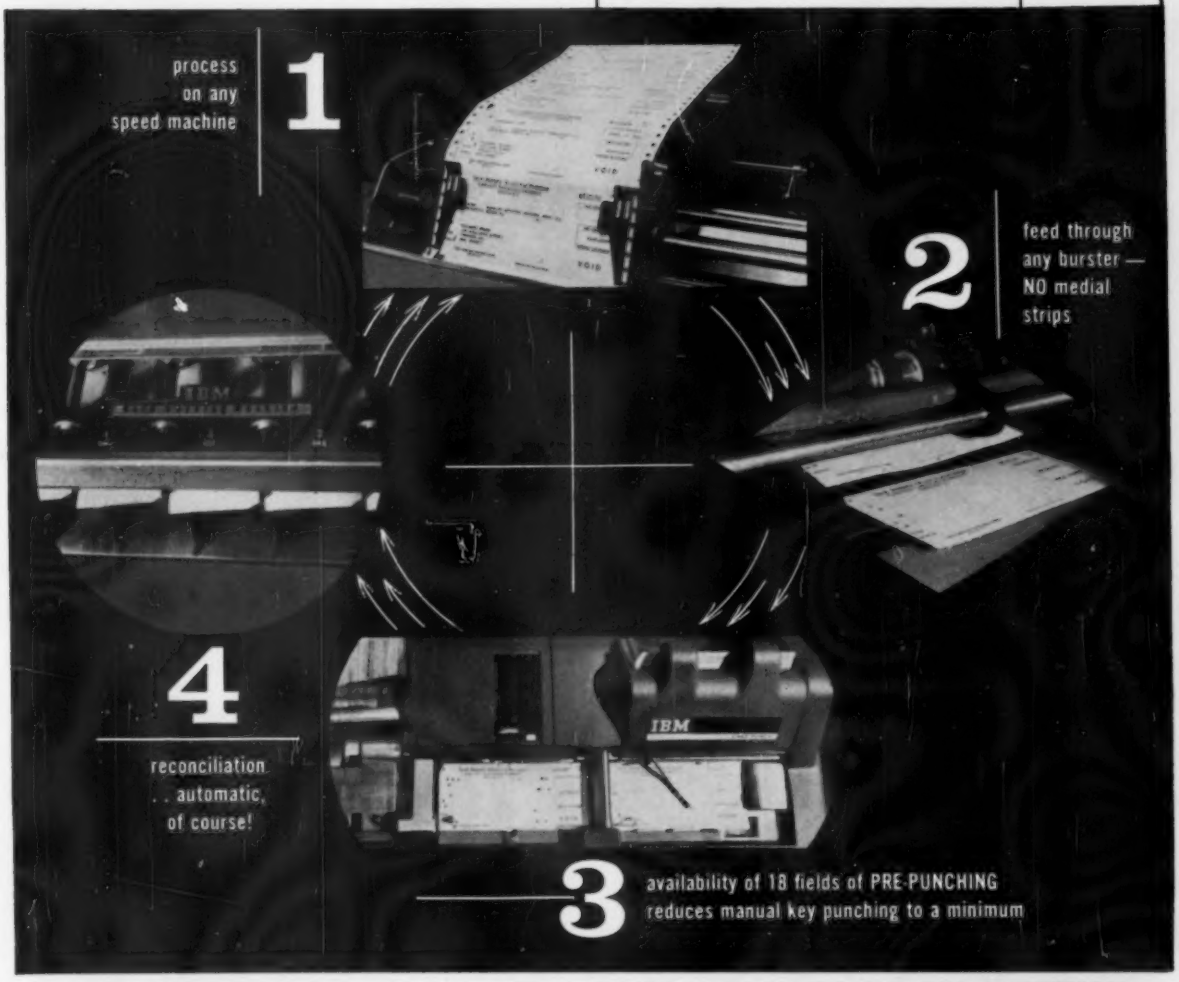
EASIER HANDLING



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the ONLY continuous PRE-PUNCHED tab cards with variable depth vouchers . . made under one roof in multiple part sets.

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Forms inc

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Manufacturers of line-hole continuous business forms

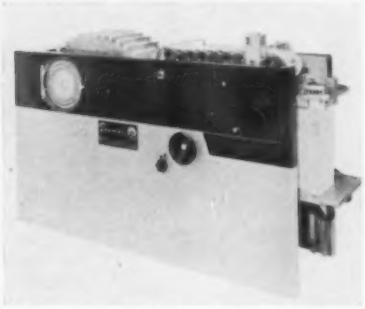
Sales Representatives in principal cities.

For More Information Circle Reader Service Card No. 188

MBA Showcase

New Products for Business Automation

Improved "Rotomatic"



Thomas Collators' automatic, 50-station "Rotomatic" collator has recently undergone several changes to make operation more convenient and improve paper flow. The controls have been repositioned to give the operator a better access to the machine. At the same time, smoother paper flow has been achieved by installation of simplified guides that receive sheets earlier in the collating cycle. Design has also been modernized in accordance with the recommendation of a prominent industrial designer, and the color of the unit has been changed to reflect the latest trend to harmonies of gray. Circle No. 116

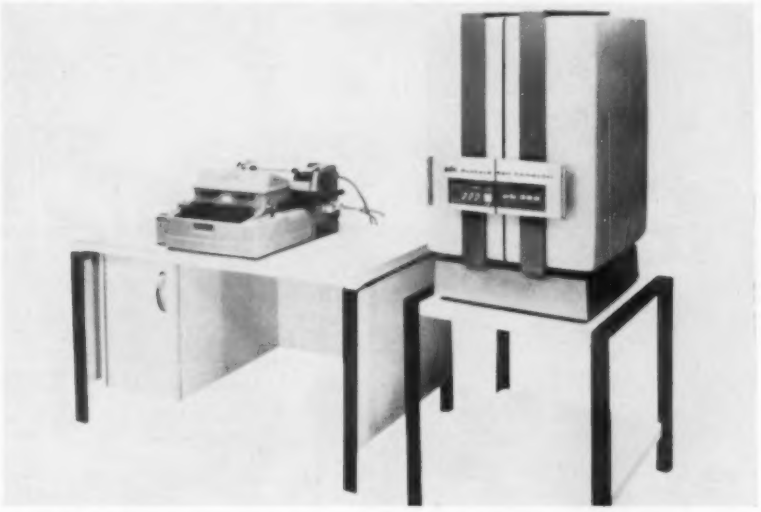
Computer Tapes

Two new types of reinforced, opaque computer tape have been developed by Arvey Corp. for use in programming applications with photoelectric or mechanical readers. The tapes are credited with high tear and tensile strength as well as dimensional stability. Both can go through readers thousands of times without breaks or malfunctions due to deformation or elongation of code signal or feed holes. Two thicknesses, .0025 for photoelectric reading, and .0045 for photoelectric and mechanical, are available in standard and special tape widths. Circle No. 106

Card-punching Printer

The Univac On-Line Card-Punching printer, which prints 1,820 characters of information on one punched card at speeds up to 1,560 lines a minute, has been announced by Remington Rand. The unit permits users of the Solid-State 80 to reduce the size of their files and speed up search time. By-passing intermediary printing steps by its "on-line" principle, the printer permits data to be fed directly from the computer at high speed. The machine rental is $2,700 a month, and orders are on a 12-month delivery basis. Circle No. 115

Packard Bell Introduces General Computer

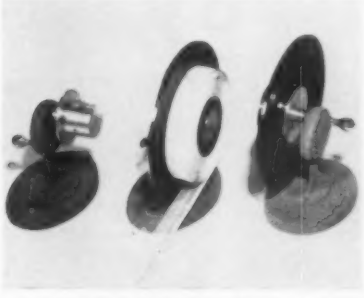


The PB250 computer marks the entry of Packard Bell Computer Corp. into the general purpose computer field. According to the company, the new system has speeds up to 400 times that of earlier units of comparable size. It has been designed for application in a broad range of scientific, industrial and military problems. Specific uses include (1) an engineer's desk-side computer, and (2) an on-line computer for process monitoring, process control, data-logging and alarm generation. The PB250 is credited with ability to serve as the central element in devices presently treated as special purpose systems. Price is $30,000. Circle No. 118

Magnetic Tab Cards

A new, visible tab card, the Magne-Tab, has been engineered to permit faster finding and filing of tab cards. Each card has a permanent built-in magnetic action which causes the cards to repel each other at the touch of a finger. Twenty or more fan-out automatically in the file trays at any point of reference, exposing the top edge of all the cards instantly and allowing sufficient space between each card for quick removal (even with mittens on as the picture illustrates). The Magne-Tab cards can be used in all existing automatic sorting and punching machines. From Business Efficiency Aids. Circle No. 104

Tape Winders



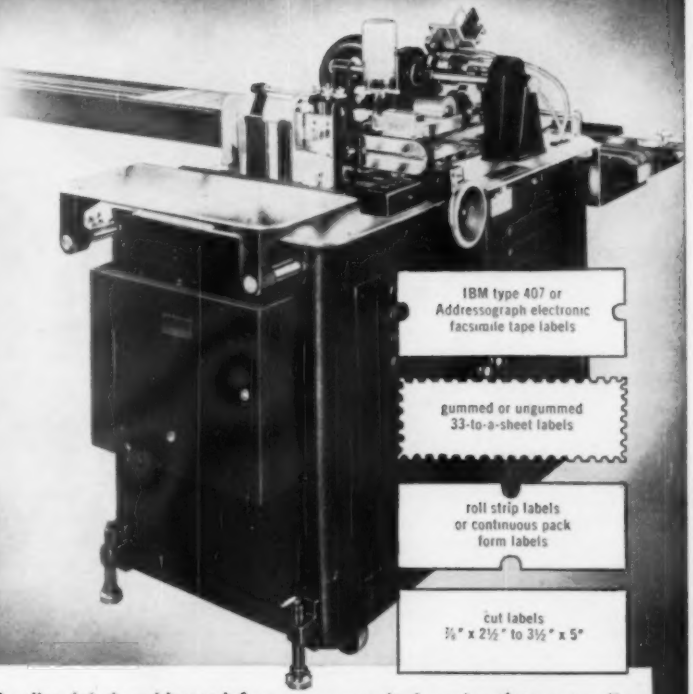
Paper tape winders and re-winders are now available with adapters for computer in-put and out-put reels to increase the efficiency of the system. Dresser Products, Inc. has produced various models. The one pictured here is Adapter No. 8060 which works with the RCA 501 and the Burroughs 220 computers. Adapter No. 8057 is also available for the Burroughs 205. Circle No. 110

Motorized File Units

Wheeldex & Simpla Products, Inc. offers new "Motorshelf" filing units for standard correspondence or legal-size records. Files are delivered by means of an automatic self-leveling toggle switch or a set of push buttons which selects the most convenient position for the operator. A single unit is said to replace an average of 17 regular-size correspondence file drawers. Unattached standard worktables of various shapes and sizes are available. Circle No. 108

NOW! PRINTED PIECES

LABELED AUTOMATICALLY


IBM type 407 or Addressograph electronic facsimile tape labels
gummed or ungummed 33-to-a-sheet labels
roll strip labels or continuous pack form labels
cut labels 7/8" x 2½" to 3½" x 5"

Applies labels addressed from your punched cards, plates, stencils and other addressing systems. *Even applies cut or individual labels!* Trims costs by applying in excess of 14,000 labels per hour. Handles post cards, insertion cards, pamphlets, brochures . . . all sizes of envelopes . . . and lightweight booklets, magazines, catalogs and quarter-fold tabloids. Compact, too! And so simple that it can be operated by your own personnel.

The Cheshire Model E.

Write for descriptive brochure

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Dept. MB- 6

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For More Information Circle Reader Service Card No. 174

"AUTOMATABELS...

SO EFFICIENT, SO THRIFTY!"

Start saving up to 10% *right now* with Ever Ready's new pin-feed automatic labels. These amazingly inexpensive "Automatabels" have refashioned automatic labeling and proved a considerable savings for banks, insurance firms, schools, government agencies and virtually every type of business. In three sizes, thrifty "Automatabels" will operate smoothly and effectively in *every* business machine with a pin-feed platen or tractor feed, and in addition, are used extensively in convenient roll form for all platen feed typewriters. "Automatabels" are pressure sensitive and will adhere to almost anything. Their adhesive provides a smooth-as-glass surface when applied to tabulator cards, assuring perfect operation. Ever Ready's 50 years of label experience guarantees the finest quality at quantity prices. Send coupon below today for more detailed information on "Automatabels" and Ever Ready's Label Idea Kit. "Automatabels" come in roll form and fanfolded packs.

EVER READY LABEL CORPORATION

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leaders in label printing for almost half a century.

Gentlemen:

- ☐ Please send me detailed information regarding "Automatabels."
- ☐ Please send me actual samples of your "Automatabels."
- ☐ Please send me Ever Ready's Label Idea Kit.

NAME ..... TITLE .....

COMPANY .....

STREET ADDRESS .....

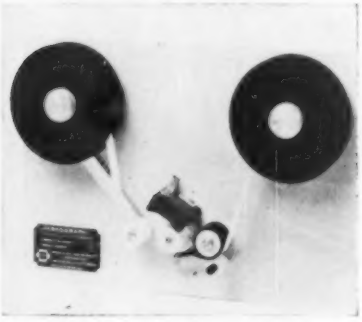
CITY, ZONE, STATE .....

For More Information Circle Reader Service Card No. 170

Redesigned Unistorall

The Wright Line, Inc. has redesigned its Unistorall line of storage units. New models match existing equipment on the outside, but changes in the interior offers increased storage capacity and more flexibility. Shelf storage of control panels as well as channel storage is available, and all models can have covers as an optional feature. The new line will be on display at the NMAA exhibit in San Francisco. Circle No. 101

Digital Data Recorder

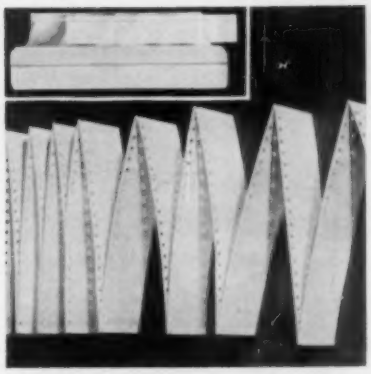


The Perfograph digital data recorder introduced by Advanced Instrument Corp. can record physical quantity information in a form both visually-readable and machine-sensible. Information is stored in digital form (up to eight channels and any digital coding may be accommodated) on paper tape. The data is later interpreted by photoelectric tape readers. The recorder is small in size and has a low power consumption, making it suitable for a general-purpose, portable unit in gathering in-plant industrial and commercial data. Circle No. 102

Sound-Proofed Cabinet for Business Machines

The newly-developed 101KP sound-proofing cabinet for business machines, such as key punch units or document writers, is said to cut noise down 70 percent when the machines are in operation. Built by International Sound Control, the cabinets also provide indirect lighting over the entire work area. They are designed to fit over the top of the machine itself and feature a Plexiglas shield that recesses back into the cabinet when opened. The company points out that the use of the cabinets make it possible to have the machines in the area of the source material, rather than in a special room, and operator efficiency and morale increase because the fatigue and noise are reduced. Circle No. 122

Strip Index Inserts



Index tab inserts in continuous strips, which are available in regular or pin-feed styles, have been announced by the G. J. Aigner Co. In regular form the strips enable nonstop manual typing of insert titles, eliminating handling of shorter strips. In pin-feed form, the continuous strip is punched for feeding into automatic printing equipment where insert titles are automatically printed from punched cards. Over 200 form inserts are on one strip. Circle No. 123

HORIZONTAL and VERTICAL

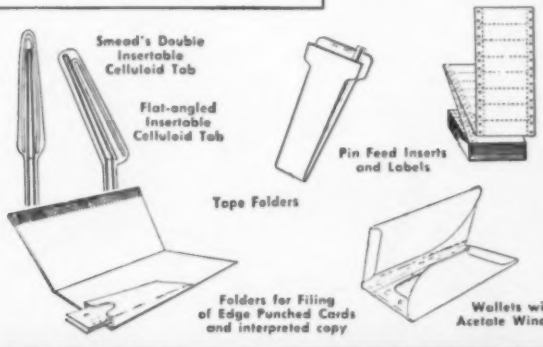
TABULATING CARD GUIDES

by Smead

also POCKETS—FOLDERS—BINDERS
USED IN ALL TYPES OF
AUTOMATED SYSTEMS

A COMPLETE LINE OF HIGHEST QUALITY
INDEX GUIDES

SELF-INDEXING CARD HOLDER
Provides clear vision and protection of card. All Acetate (10 Point). Overall size 7⅜" x 3⅜".


Smead's Double Insertable Celluloid Tab
Flat-angled Insertable Celluloid Tab
Pin Feed Inserts and Labels
Tape Folders
Folders for Filing of Edge Punched Cards and interpreted copy
Wallets with Acetate Windows

Smead's complete selection of guides for indexing tabulating cards will cover almost every requirement. If a special style is needed, it can be tailor-made for your customer.

Choice of three materials in Card Guides: Bristol for temporary use; Gray Pressboard for long life under normal usage; Vulcanized Fibre for hard usage.

Smead can design and manufacture folders, pockets, or combination folders and pockets for filing punched tapes, tabulating cards, and associated documents. Smead offers the advantages of a wide range of facilities in paper converting and can incorporate acetates or vinyls to resist "bleeding" of oil from tape.

Smead MANUFACTURING COMPANY • HASTINGS, MINNESOTA
LOGAN, OHIO • CHICAGO, ILLINOIS • LOS ANGELES, CALIFORNIA

For More Information Circle Reader Service Card No. 175

Two-hole kit (shown) **$13.90**

For binding office records, letters, work sheets, blueprints, scrapbooks and papers of all types. So handy, so easy, so versatile . . . for office or home. Just insert pages and punch, then pick a colorful binding tube from the spin dial base, snap into place. In seconds you have a neat, orderly looking, colorful volume.

Other models available:

3-hole kit....$17.90 • 4-hole kit....$29.90

Write for free booklet—MB

TAUBER PLASTICS, INC.

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Circle Reader Service Card No. 184

"Maggie" Magnetic Boards Keep You on Top of Every Operation

"Maggie" Magnetic Visual Controls offer the easiest and quickest way to chart sales, traffic, personnel or any other phase of your business. Colorful, magnetic indicators tell you at a glance if everything is in the right place at the right time. No cards, pegs or other nuisance devices to replace because "Maggie" Board with magnetic indicators last indefinitely. Pays for itself many times over because the first cost is the last cost.

Priced from $49.50 complete.

Write for FREE catalogue on the most modern and flexible control system available today.

maggie magnetic visual aids corp.
11 West 42nd Street • New York 36, N. Y.

Circle Reader Service Card No. 185

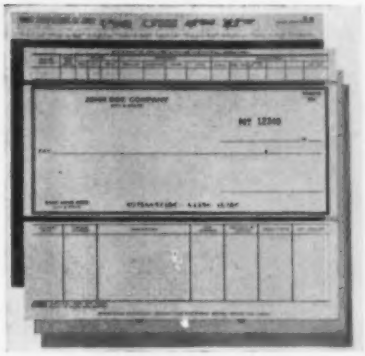
IBM to Market $10 Million Computer System

The $10-million-and-up IBM STRETCH-type computers are now available to business and government agencies, the company just reported. These powerful systems (rated 75 times faster than the large-scale IBM 704 systems) can actually complete 100 billion computations in a single day — at a very low per-unit cost. The system is slated for controlling and balancing the many aspects of a large, decentralized corporation. With STRETCH technology, IBM states that it will be possible for the first time to make a complete mathematical model of a complex corporation's operations — showing how various management decisions would affect these operations. Among the revolutionary features of the system is a "Look-Ahead" device which looks beyond the work already in the machine so that the computer can anticipate what is to come and automatically assign tasks to its various parts. At the same time, IBM announced TRACTOR, a computer magnetic tape system termed the world's fastest. It is 24 times faster than systems now in use, and its tape reels will store 60 billion characters — the equivalent of a library of 150,000 volumes. Sealed cartridges containing the tape reels are stored within the unit. These cartridges are brought into position automatically by the computer for reading and writing. The unit can manipulate as many as 640 reels, and literally permits the machine to "read" and "write" 1½ million characters a second. Circle No. 122

Closed-Circuit TV Camera for Varied Applications

A self-contained, single-unit, transistorized, closed-circuit television camera designed to function at top efficiency under extreme conditions of vibration and noise has been announced by General Electric Co. The TE-9-A weighs 9 lbs. and is contained in a cylindrical aluminum, dust-tight housing. It is described as having application in educational TV and commercial fields as well as in industry where mobility is important. Circle No. 111

Magnetic Ink Checks



Wilson Jones Co. has redesigned its Grayline "Snap-A-Way" checks to permit magnetic ink encoding. The carbon-interleaved checks will be available about June 1. Main change in the design involves leaving a five-eighths inch clear band along the bottom of the check to accept the magnetic ink characters imprinted by the bank. The Grayline checks, which are available in quantities as small as 250, may be "crash imprinted" (enough pressure on check to allow a carbon impression to carry through to the first and second copies) to a customer's specifications. Circle No. 103

Panel/Reel Storage

Data/Storage Inc., a new company manufacturing machine accounting panel and tape reel storage equipment has introduced its Data/Stor line. Company states the units occupy less floor space than similar products while offering capacity equal to or greater than some. All equipment is supplied with self-storing steel tambour doors at no extra cost. One standard unit can be set up for 42 interior arrangements by using a screwdriver to make location adjustments. Circle No. 113

I'M GOING TO TELL YOU WHY...

I'm going to tell you why you will have a smoother tab room operation (and undoubtedly save money, too) when you use GC Data Processing Forms.

It will take me six ads to tell the whole story. If you'd care to know my story sooner, just write for special advance copies.

DATA PROCESSING FORMS

Manufactured by:
CLARKSON PRESS INC.
A Subsidiary of
GRAPHIC CONTROLS CORPORATION
189 Van Rensselaer St., Buffalo 10, N. Y.
Buffalo 10, N. Y.

For More Information Circle Reader Service Card No. 179

Look, Boss, what Convoy "Chem-Board" Transfer Files can do for us . . .

- They're low-cost rigid, permanent drawer FILES, not boxes.
- Make semi-active, inactive records instantly available. H'ray!
- Stack on each other without shelving. $!
- Moisture, dampness won't hurt 'em, and nothing to rust . . .
- Price will surprise you, good-looks will please you.

There's a dealer near you—or write

CONVOY, INC.
STATION B, BOX 216-A
CANTON 6, OHIO

Circle Reader Service Card No. 176

for more information

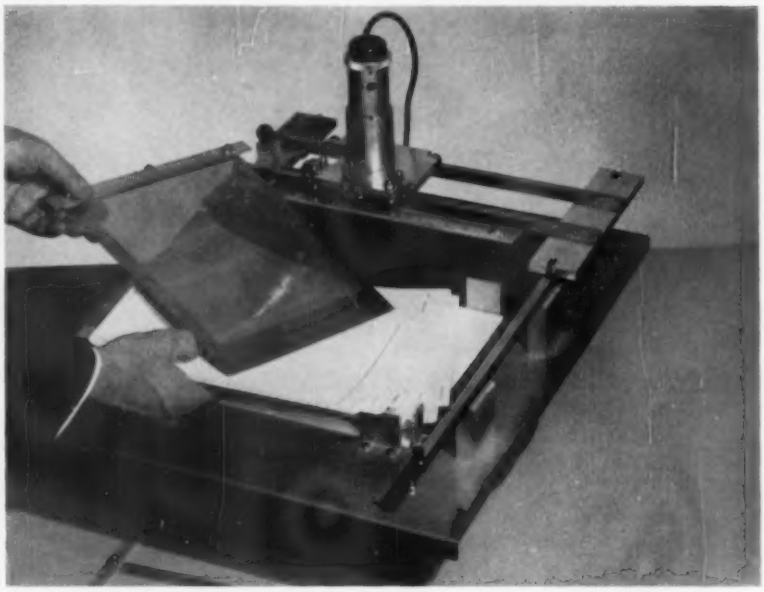
. . . about new products, or items advertised in this issue, use the convenient reader's service card opposite page 50.

The MANAGEMENT and BUSINESS AUTOMATION Service Bureau will forward your request to each manufacturer promptly, saving you time, effort and money.

This is an added free service for readers of

MANAGEMENT
and
BUSINESS AUTOMATION

"Termatrex" System of Information Retrieval



Information retrieval equipment based on an "inverse" punched-card method (as many as 10,000 items punch-coded into one card instead of one card for each item) has been developed by Jonker Business Machines, Inc. The "Termatrex" systems employ the use of these "term" or "keyword" cards to search information collections ranging from 10,000 to 200,000 items. As an example, in a personnel file of 10,000 employes, each person would have a code number. This number is punched (by precision drill) into each term card that fits the individual, and when a group of term cards is superimposed on the equipment, the serial number of the individual appears as a light dot (shining through from a light source in the base of the machine). If a search were made for "single", "male" employes who have "engineering" experience and can speak "French" to work in North Africa on a special construction job, only the code number of the employes who have these qualifications would show through when the four term cards were placed on the machine. Scientific articles, research data, design data, and inventory data can be controlled in a similar manner. Anywhere from 500 to 5,000 term cards can be punched and kept in an open file. The code holes can be gang punched in large groups of cards simultaneously to keep the information up to date. Circle No. 119

Mark-Sense "Reading Pen" for Training Use

A mark-sense "reading pen," which can be used to help an operator-in-training learn to make a mark which will be recorded accurately by electronic equipment, is now being marketed by G. C. Ericson. The device consists of two mark-sense brushes held in a plastic holder and connected to a standard ohm-meter or volt ohm-meter. The meters instantly tell the operator if he has made a mark which would be correctly read by the machine in use. It helps the trainee to learn the effect of rotating the mark-sense pencil between markings to assure consistent reading. Circle No. 107

NEWS

Predict New Approach to Computer Design at WJC Conference

A leveling off in the rate of advance of technical computer performance was predicted by several authorities at the 1960 Western Joint Computer Conference held in San Francisco, May 3-5.

An estimated audience of 1,500, comprised primarily of computer engineers and designers, listened to over 30 top computer professionals describe new directions in computer technology associated with the theme of the conference, "The Challenge of the Next Decade."

One of the more popular sessions, "Computer Organization Trends," was headed by Arthur J. Critchlow of IBM, San Jose. He forecasted an end to the rapid increases in speed and performance which have characterized the computer industry the past few years.

Instead, Critchlow stated that new developments would center on drastic organizational changes. New computers will have several operations going on at the same time. Modular design will be very popular with the building block idea in vogue, particularly in business applications. Critchlow indicated also that his group feels that the distinction between general purpose and special purpose computers will become hazy and perhaps will disappear completely.

"Living Computers"

The keynote address, "Living Computers," was given by Prof. Heinz Von Foerster of the University of Illinois. A leading theorist in computer research and development, Prof. Von Foerster told of current research which will bring the computer closer to the performance of functions of the human mind. Development of electronic property filters which can add sensory capabilities to computer systems are a major step.

Walter F. Bauer of Intellectronics Laboratories, Thompson Ramo-Wooldridge, Inc., also expanded on the subject of "computer organization." He first commented on the use of this phrase in recent months as a substitute for the more limiting phrase, "computer system design," and encouraged its use by the computer profession generally.

Speeds Don't Help Needs

Bauer decried the current emphasis by manufacturers on higher operating speeds. He said, "They do not necessarily provide the user with a system easily adaptable to his particular needs. There is a great need for computers which can be adapted, as a total system, to the particular needs of the user."

Looking into the future, Charles P. Bourne and Donald F. Ford of Stanford Research Institute forecast very little change in computer performance between now and 1965 from that obtained during the past five years. This prediction stemmed from an analysis of over 300 computers including those of European and Japanese manufacture.

Although more than fifty exhibiters displayed their hardware, only a few had new products available.

Among these were Packard Bell with their new PB-250 computer (see page 54); Aeronutronic's Real-time Data Entry equipment; the model 160 computer of Control Data; and the Data-stor photoelectric tape reader made by Cook Electric Company.

Ampex displayed two new tape handlers for use with business applications of all makes of computers. This equipment, the TM-1 and TM-2, attracted considerable interest among the delegates.

SEND TODAY FOR THIS FREE PORTFOLIO

. . . that shows how you can save up to 95% in label setup time, as reported by U.S. Testing Company Learn how self sticking non-moistening Able-Stik

Pin-Feed labels open new horizons for Data Processing Equipment. Valuable ideas in this portfolio will show you how to get increased versatility, greater efficiency and more economy from your IDP machines. Send for your copy today.

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Share your ideas for making IDP machines more versatile and

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a valuable prize for each idea used. Send for Able-Stik Automation Labelation portfolio and Contest Entry Blank.

Allen Hollander Company, Inc. Dept. MB6
385 Gerard Avenue, New York 51, New York
Gentlemen:
Please send me your free Portfolio of Data Processing label ideas, along with contest entry blank.

Name_____
Title_____
Company_____
Address_____
City_____ Zone____ State_____

For More Information Circle Reader Service Card No. 180

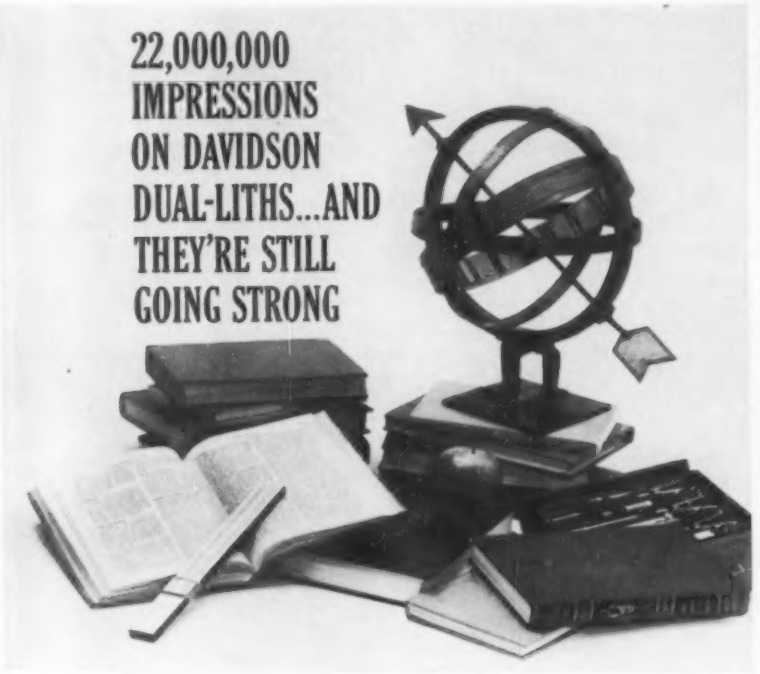
Royal McBee's 400th Computer Installed

Special ceremonies marked the installation of the 400th Royal Precision LGP-30 computer in the offices of the Continental Oil Co. in Ponca City, Okla.

The Royal McBee system was installed to provide the company's staff of research engineers with a "compact but powerful electronic computer useful in preparing speculative process designs, digesting and interpreting pilot plant data and investigating potential process control applications," according to J. R. Bowden, Research Group Leader of the oil company's Petrochemical Research Division.

It will supplement a larger computer now available in Conoco's Computer Department.

Attending the ceremony were A. T. Craft, vice president of data processing for Royal McBee; R. L. Bosworth, vice president of Continental Oil; Dr. M. C. Sharrah, manager of Conoco's Research and Development, and Conoco staff members.



As educational publishers, SCOTT, FORESMAN & COMPANY, of Chicago, creates and distributes about twenty different titles each year which range from kindergarten readers to college textbooks.

To supply high quality support literature and to help out with routine printing, SCOTT, FORESMAN operates an internal duplicating department equipped with Davidson Dual-Liths Model 241 and Model 233. The company has found the Dual-Liths not only insure superlative printing quality and versatility, but often halve the job time compared with the other machines considered. The Dual-Lith 241 can handle up to 6,000 sheets an hour and the Dual-Lith 233 up to 5,400 an hour. If required, jobs can often be run 2-up with *both sides printed simultaneously*, with enormous savings in job time and costs. Set-up time is short, the 241 taking only 4 to 5 minutes from finished plate to production run. The 233 takes slightly longer.

Since SCOTT, FORESMAN installed the Dual-Liths in 1946, it has produced over *22,000,000 impressions* with only a few minor stoppages...a remarkable record.

Outstanding dependability is only one feature of Davidson Dual-Liths. They can substantially reduce *your* printing costs *and* provide superb "professional-quality" work. For the complete story on how Dual-Liths help SCOTT, FORESMAN, call your Davidson Distributor (he's listed in the Yellow Pages)—or write to Davidson Corporation, 29 Ryerson Street, Brooklyn 5, New York.

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Farrington Acquires Mendes Corp. Assets

With the acquisition of the Mendes Corp. through a stock transaction, the Farrington Mfg. Co. took another major step in strengthening its growing position in the business machine field.

The Mendes Corp., producers of collating and forms preparation equipment since 1945, has been renamed the Farrington Business Machines Corp. and will operate as a wholly-owned subsidiary with Donald G. Colley, former Mendes president, now executive vice president of the subsidiary.

Farrington recently expanded into the business equipment field on a world-wide basis when it acquired Adrema Ltd., a major manufacturer in the United Kingdom. It also acquired Printed Electronics Corp. of Natick, Mass., producers of printed circuits for computers and guidance systems in 1959.

Early last year, it acquired Intelligent Machines Research Corp., developer of what is now called the Farrington optical scanning reading machines.

Defense Department At Microfilm Show

The Department of Defense played a leading role at the ninth annual convention of the National Microfilm Association in New York by explaining in detail its Engineering Data Micro-reproduction System standards.

The standards and specifications set up by the Department are intended to encompass the complete range of microfilm. They are serving as a forerunner for a new DOD project, the Engineering Data Document System, which will standardize the technical documentation needed for research and development, engineering procurement, supply and maintenance of military items.

It is expected that the microfilm industry will adopt the new standards for its own.

One of the more important aspects of the EDMS program was the establishment of specifications and standards covering all requirements for preparing aperature cards.

Firestone Inaugurates Tele-processing System

Harvey S. Firestone, Jr., seated at the card punching unit in the data processing center at the Firestone Tire & Rubber Co. headquarters in Akron, Ohio, inspects the new Tele-processing system now in operation. Thomas J. Watson, Jr., president of International Business Machines Corp., points out the speed of the data transmission over the previous method.

Firestone Tire & Rubber Co. has completed testing of a 5,100-mile Tele-processing system network which provides instantaneous data communication between the Akron, Ohio, computer center and the company's field offices.

Utilizing equipment manufactured by IBM, and A.T.&T.'s Dataphone, the system permits transmission of complex data over ordinary telephone long lines. It is in operation gathering payroll and retail sales information in 50 states.

The accounting data is keypunched into cards at the various field offices and put on IBM Transceivers. These units "read" the cards and produce impulses which pass through the Dataphone unit and become signals suitable for phone transmission. The reverse process occurs at the data processing central in Akron, with the cards being fed immediately into an IBM 705 computer system.

Victor R. Clary, manager of the sales accounting and data processing departments, indicated that this application replaces one which tied into the firm's admistrative teletype network. Under the old system, the line costs were high, the network was loaded to the point of overtime, and the conversion of card information into paper tape and then back to cards was slower and required more clerical time, he stated.

Control Data Opens Computer Center

Control Data Corp. has established a computing center at its Computer Division's home office in Minneapolis, Minn.

Termed "the highest capacity operational commercial computing center in the U.S." by Frank C. Mullaney, vice president and general manager of the division, the facility will feature the large-scale 1604 system and a complete battery of peripheral equipment including two model 1607 magnetic tape systems.

In July, the facility will be expanded by the addition of the firm's new 160 intermediate capacity computer.

The center will be used for several purposes, with primary time devoted to the testing of customer's problems. Time on a service-bureau basis will be made available to universities, scientific and business organizations.

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Copies On Request

The following booklets, catalogs and brochures are considered of interest to readers of MANAGEMENT and BUSINESS AUTOMATION. Copies can be obtained by using the Reader Service Card.

Automation / Labelation — "IDP Ideas" is the title of a portfolio explaining ways in which integrated data processing equipment can be made more versatile through the use of pin-feed, pressure-sensitive labels. From Allen Hollander Co. Circle No. 131

Electric Mimeograph—a folder describing the new Model 434 A. B. Dick mimeograph equipment is available. Supplies and extras are outlined. Circle No. 132

Photocopy Papers—Brochure from Ampto, Inc. describes and lists user applications for company's diffusion transfer photocopy papers and films. Circle No. 133

Portable Dictating Machine—The new "triple purpose" portable dictation/transcription machine, the Coronet by Comptometer Corp. is covered in a two-page bulletin. Circle No. 134

Computer Invoice Preparation — An illustrated bulletin describing the Bendix G-15 computer system in preparation of invoices and account updating is available from Bendix Computer Division. Circle No. 135

"Pros and Cons of Leasing"—A third edition of the Foundation for Management Research study on equipment leasing for smaller manufacturers, department stores and supermarkets has recently been released. New section covers renewals and options-to-buy at the end of the lease period. Circle No. 136

Wholesaler Inventory Control—A case history on controlling a 13,000-item inventory with the Remington Rand Kardex system is described in a new four-page brochure. Company covered is Aaron & Co., New Jersey wholesalers of plumbing, heating and air conditions parts and equipment. Circle No. 137

MBA's Calendar

June 22-24—National Conference and Business Show of the National Machine Accountants Association, San Francisco, Calif. Mark Hopkins and Fairmont hotels and California Masonic Memorial Temple for exhibits. For information, write P.O. Box 3617, Rincon Annex, San Francisco 19.

July 28-29—Symposium on Computers and Data Processing, sponsored by the University of Denver. Stanley Hotel, Estes Park, Colorado. Contact W. H. Eichelberger, Denver Research Institute, University Park, Denver 10, Colo.

August 23-25—Annual Meeting-National Conference of the Association for Computing Machinery, Marquette University, Milwaukee, Wisc.

August 23-26—Western Electronic Show & Convention, sponsored by the Western Electronic Manufacturers Association and the Los Angeles-San Francisco Seventh Region of the IRE. Sports Arena, Los Angeles.

September 26-30—15th Annual Meeting of the Instrument Society of America and Third Instrument-Automation Conference and Exhibit of 1960 at the New York Coliseum, New York City.

October 10-12—International Systems Meeting (SPA). Hotel Commodore, New York City. Write International Headquarters, Systems & Procedures Association, 4463 Penobscot Bldg., Detroit 26, Mich.

October 10-12—National Convention, NABAC, the Association for Bank Audit, Control and Operation. Statler Hotel, Los Angeles, Calif. Information from Jack Craddock, NABAC, 38 So. Dearborn St., Chicago 3, Ill.

October 19-22—American Records Management Association's Annual Convention and Records Management Workshop, at the Plankinton House, in Milwaukee, Wisc.

October 20-22—Seventh International Meeting of the Institute of Management Sciences. Hotel Roosevelt, New York City. Session on Computers in Simulation. Information from James Townsend, 30 East 42nd St., New York 17, N. Y.

October 22-26—29th Annual National Conference of the Controllers Institute of America at the Hotel Fairmont in San Francisco, Calif.

October 24-28—National Business Show, Office Executives Association. At the Coliseum, New York City. Contact George H. Gutekunst, Jr., NBS, 530 Fifth Ave., New York 36, N. Y.

October 26-27—Computer Application Symposium sponsored by the Armour Research Foundation of the Illinois Institute of Technology, Morrison Hotel, Chicago. Write Andrew Ungar, Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill.

November 1-4—The Business Equipment Exposition, second major equipment show sponsored by the Office Equipment Manufacturers Exhibits, Inc., at the Los Angeles Memorial Sports Arena in Los Angeles, Calif. Write: OEME Headquarters, 777 14th St., N. W., Washington 5, D. C.

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EDITORIAL

Little Myth Makers

The "electronic brain" has been proven to be a product of 20th Century mythology. But, myths die hard. The appalling ignorance of computer functions evidenced by editors of the daily press, combined with their affinity for science-fiction headlines, have been the chief factors in keeping a confused image of the electronic computer in the public mind. Constant use of such terms as "electronic brain" and "thinking machine" have only served to promote the computer as a modern "Frankenstein's Monster" designed to replace man's mind and his livelihood.

The scientist could also use better judgment when discussing computer developments, knowing that the press is apt to twist the text in order to provide exciting copy. Some scientists appear to be slanting their remarks deliberately to gain this kind of publicity.

As as a case in point, take the statement made recently before the New York Academy of Sciences by M.I.T.'s Dr. Warren S. McCullough: "Now it appears we will be ruled by machines, not laws." To support this theory, the good doctor described a British computer—"an executive thinking machine"—that makes the top management decisions for an English restaurant chain. Needless to say, Dr. McCullough was successful in his apparent bid for headlines.

There is no questioning the computer's superiority as a thinking and decision-making aid to management. But, until it develops such things as a heartbeat, headaches and hangovers, we doubt that it will ever make any actual executive decisions.

As to replacing man, we note that the Monthly Labor Review has published the results of its recent study on the employment impact of electronic computers for data processing. Some 20 offices were covered in the automation survey—among them the offices of some of the country's largest corporations. The net result, after one year of computer operations: nine persons laid off in all! This news will probably not make headlines, but it makes a lot of sense.

The computer was developed to fulfill a need, not to destroy—to assist man, not eliminate him. Its impact on our society will be great — and good. Professors and editors, please note.

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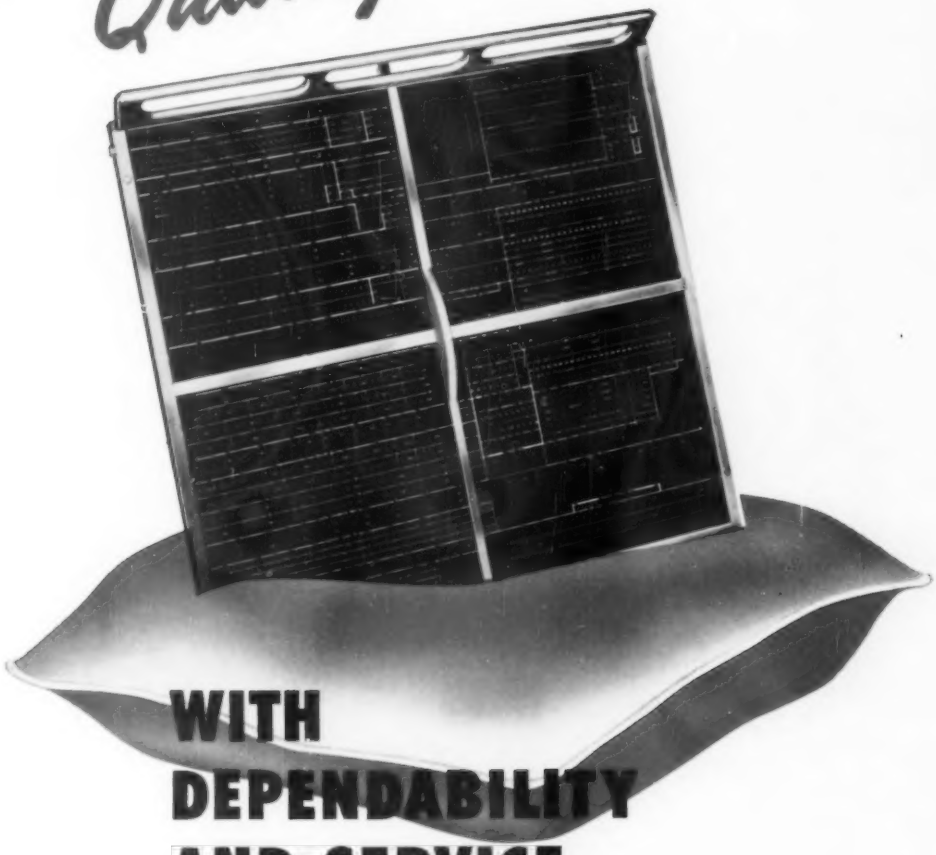

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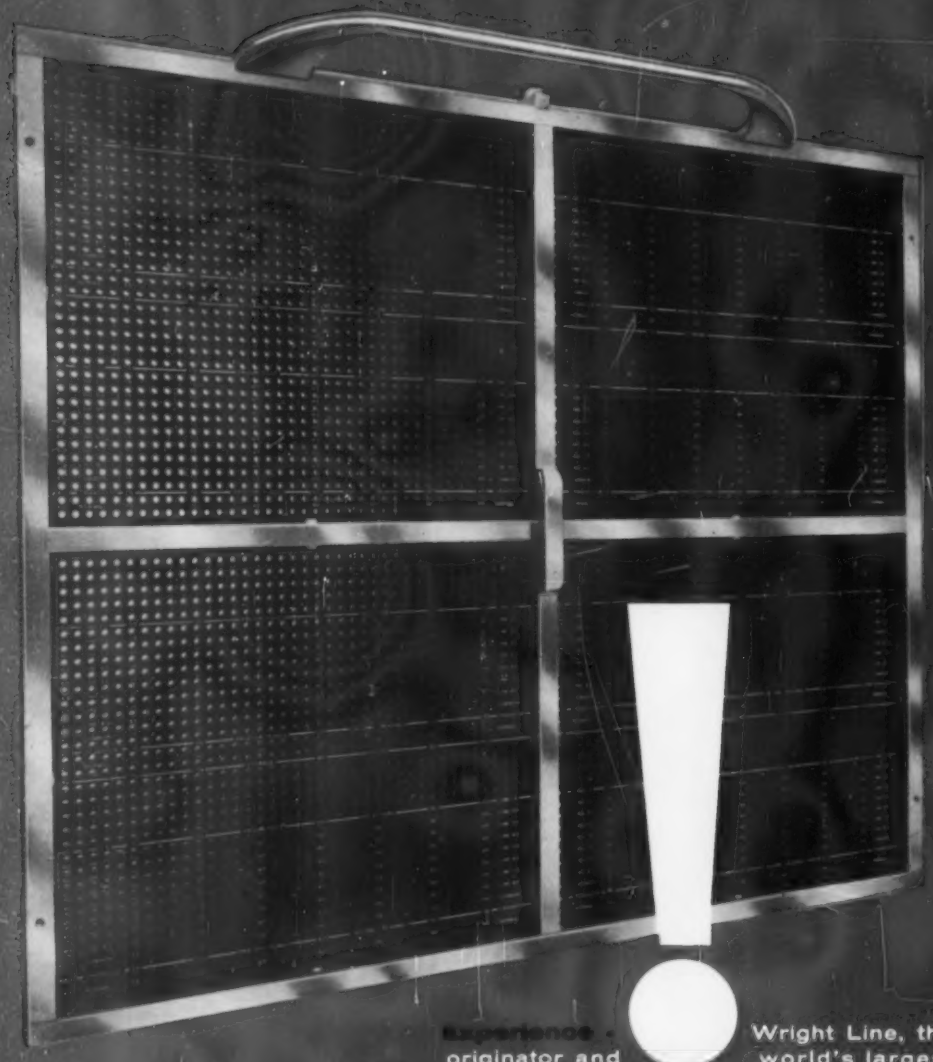

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